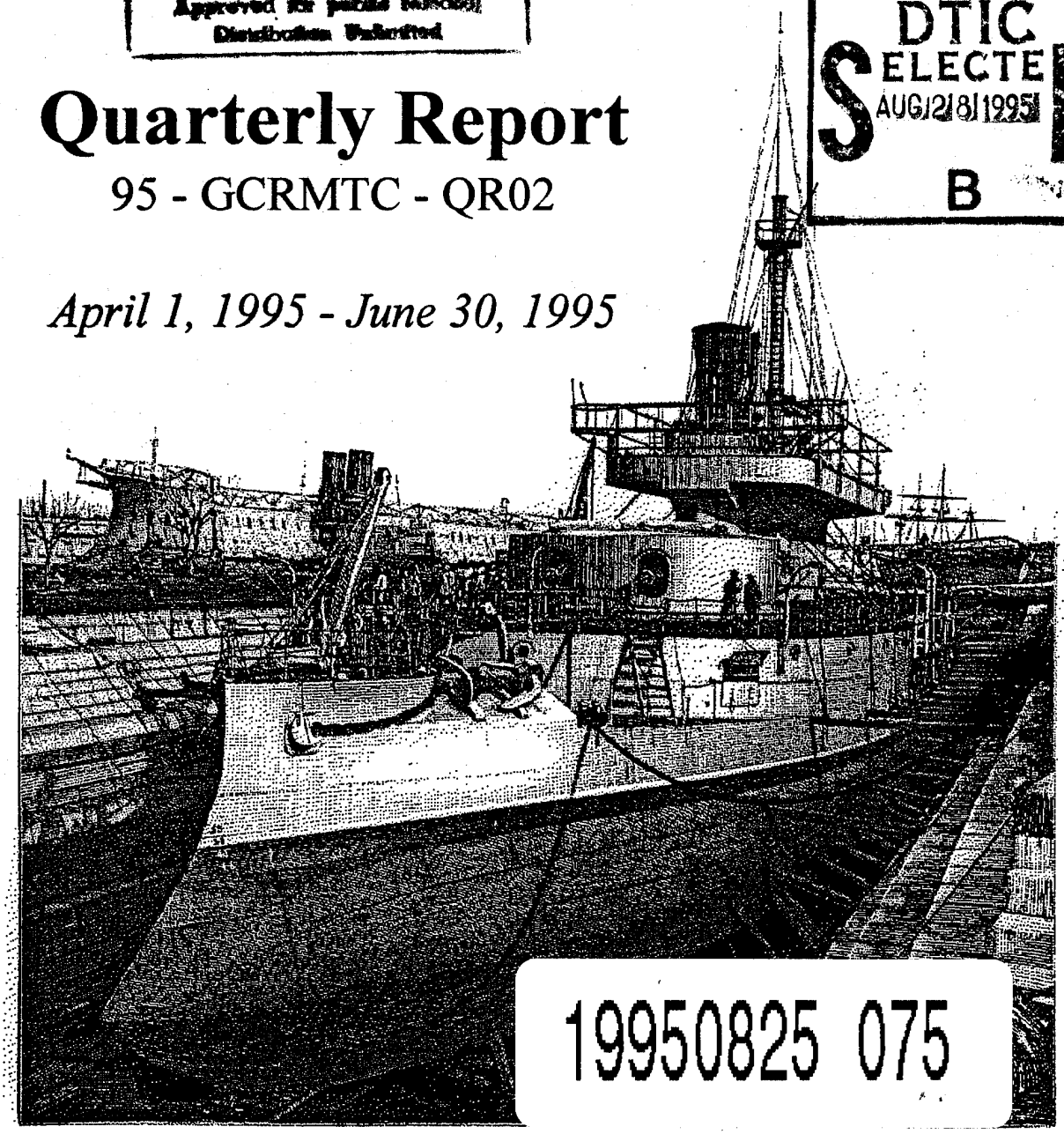
GULF COAST REGION MARITIME TECHNOLOGY CENTER

Quarterly Report

95 - GCRMTC - QR02

April 1, 1995 - June 30, 1995



GULF COAST REGION MARITIME TECHNOLOGY CENTER

QUARTERLY REPORT

95-GCRMTC-QR02

Cooperative Agreement N00014-94-2-0011

REPORT PERIOD: Apr 1, 1995 - Jun 30, 1995

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Appendix	Title
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EXECUTIVE SUMMARY

The Gulf Coast Region Maritime Technology Center (GCRMTC) was initiated September 26, 1994 and has filled nearly all its positions at both sites (Orange Site and New Orleans Site) and the Center. The infrastructure buildup consisting of renovation of facilities and acquisition of research equipment, computer hardware and software is nearing completion.

The Government/Industry Advisory Board (GIAB) was formed and met at the New Orleans Site on May 4, 1995 to give guidance and direction to the GCRMTC. The GIAB reviewed and made recommendations regarding 100 Stage II Problem Statements submitted in response to a nationwide solicitation. Based on the GIAB recommendations, and the approval of the Government Program Manager, the Center prepared and will issue Requests for Proposals for five approved Stage II Problem Statements. Also based on these recommendations the Center prepared an Annual Program Plan which has been submitted to the Government Program Manager.

Research projects were initiated at both sites with most starting January 1, 1995 and are fully operational at present. Status reports of 15 research projects being conducted at both sites are appended for reference. Research projects being conducted at both sites are in collaboration with shipbuilding/marine industry partners.

The GCRMTC initiated the Environmental Resources and Information Center (ERIC) which is colocated at the New Orleans Site. ERIC will be a depository and resource for environmental issues of concern to the shipbuilding industries.

The Orange Site has nearly completed its Simulation-Based Design facility at Orange, Texas. The Silicon Graphics workstations and considerable associated software have been purchased and are operational.

The budget projections for FY95-99 are included for both sites and the Center. The projections include in-house research and sub-contracted research project expenditures for a five year period.

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GCRMTC QUARTERLY REPORT
April 1 - June 30, 1995

1. INTRODUCTION

The Gulf Coast Region Maritime Technology Center (GCRMTC) was initiated September 26, 1994 and has filled nearly all its initial positions at both Sites and the Center. The initial thrust of the Center has been for the most part completed. This included the following tasks: 1.) hiring the staff, 2.) renovating office/research space, 3.) purchasing infrastructure software, equipment, office equipment and furniture, 4.) initiating In-House Research projects and 5.) establishing an Environmental Resource Information Center (ERIC).

2. GOVERNMENT INDUSTRY ADVISORY BOARD(GIAB) MEETING

The GIAB met at the University of New Orleans on May 4, 1995. Approximately 100 Stage II Problem Statements that had been submitted in response to a nationwide solicitation were reviewed by Board members. Several Problem Statements were recommended by the Board to the Government Program Manager for issuance as a Request for Proposal (RFP). Appendix A lists: 1) the attendees at the GIAB meeting and 2) the Problem Statement Titles that were recommended for approval.

3. ANNUAL PROGRAM PLAN

As part of the requirements of the Cooperative Agreement, the Center submitted an annual Program Plan to the Government Program Manager. The Plan relied on input from the GIAB meeting and the New Orleans and Orange Sites. The Government Program Manager approved issuance of an RFP for the five industry Problem Statements shown in Appendix A. Appendix B is a copy of the Annual Program Plan that was submitted and for which approval is pending. (Enclosures (1) and (2) to the Plan are already included in Appendix A).

4. NEW ORLEANS SITE ACTIVITY REPORT

4.1 In-House Research Projects

Currently there are 12 research projects in various stages of progress. The latest, "Integrated Environmental Management Plan" commenced June 1, 1995. During this period, one project "PM Motor Drives", was terminated due to the inability of the P. I. to respond in a timely fashion.

The quarterly reports of the following 12 research projects are attached as appendices to this report:

GCRMTC Project No.	Title	Appendix
AMTC95-001B	Inexpensive Non-Toxic Pigment Substitute for Chromium in Primer for Aluminum Substrate	C
AMTC95-008A	Integrated Environmental Management Plan for Shipbuilding Facilities	D
AMTC95-010A	Development of High Speed Marine Vehicle Design Database	E
AMTC95-014A	Applications of Integrated Optical Fiber Sensor Systems in Shipbuilding and Shipboard Monitoring	F
AMTC95-016A	Research in Shipboard Sensors	G
AMTC95-018A	Ships' Reliability, Availability, and Maintainability (RAM) Database	H
AMTC95-020A	Performance Simulation of Marine Propulsion Systems under Extreme Conditions	I
AMTC95-023B	Study of Structural Design Procedures in the Shipbuilding Industry	J
AMTC95-027A	Software Applications for Shipbuilding Optimization	K
AMTC95-030A	Improving Technology in the Shipbuilding Industry	L
AMTC95-035A	Digital Image Photogrammetry	M
AMTC95-036A	Predicting Ship Roll Damping	N

4.2 Subcontracted Industry Research (NBDL)

A sub-contract was issued to the Naval Biodynamics Laboratory (NBDL) to carry out a research project, "Motion Sickness and Anti-Motion Sickness Treatment". The status of the project is included in Appendix O.

4.3 Infrastructure Build-up Status

The bulk of the infrastructure equipment, directly associated with ongoing research projects, has been ordered or is out on bids at present. The remaining infrastructure equipment has or will shortly be ordered and should be received during the next six months.

4.4 Education and Training

Pursuant to the GCRMTC statement of work, the New Orleans Site plans to undertake several education and training projects to meet the needs of the marine industry. These projects were based on the February 22-23, 1995 Workshop findings and were discussed at the May GIAB meeting. At present a workshop is envisioned for Technologies Enabling Agile Manufacturing and Welding (Naval Joining Center) and an Agility Forum is being planned in conjunction with Lehigh University.

5. ORANGE SITE ACTIVITY REPORT

The Orange Site has made significant progress in establishing its facilities and working to fulfill its scope of work. The Site Director has attended and made presentations to meetings of the NSRP SP-4, SP-6, SP-8, and SP-9 Panels. In addition to attending the above panels, the Orange Site has been represented at local industry and business forums. The activities of the Orange Site during the quarter follow:

5.1. Facilities

5.1.1. Hardware

The Orange Site has received and installed the Silicon Graphics workstations and ONYX. Testing of the systems and training of the support staff is continuing. The site is continuing to complete its workstation complement and has met with representatives from Sun Microsystems, Hewlett Packard (HP), Digital Equipment Corporation (DEC), IBM, and Intergraph. The Site has requested quotes from all of the above vendors and has requested approval for the purchase of two HP workstations.

The Virtual Reality Laboratory and studio is operational with the installation of the projection system and Fakespace BOOM3C. Approval has been requested via the Center for the purchase of a head-mounted display, tracker, 3D mouse, and supporting hardware.

The initial phase of setting up basic networking services has been completed. The site is currently running Ethernet and ATM protocols in-house. The Center T-1 connection to the

Internet is operational and the site is investigating an ATM DS-3 link for connection to the Advanced Technology Network (ATDnet). The site is also investigating upgrading its file handling system from NFS to AFS. This upgrade would increase the in-house bandwidth from 60 Mbs to over 100 Mbs.

5.1.2. Software

The Orange Site has received the Varsity software suite from Silicon Graphics. This suite includes the IRIX operating system, a C++ compiler, OpenGL, and Performer. The Site has also installed Silicon Graphics In-Person collaborative videoconferencing software. This is operational in-house and over the Internet. The Site is developing its software suite to support simulation-based design projects and services as follows:

Product Modeling: The Site plans to support AutoCAD Release 13, Parametric's ProEngineer, Intergraph's ship design program. The Site has also requested quotes from the above and seeks approval from the Center to purchase two sets of ProEngineer.

Mechanical Simulation: The Site is reviewing several software applications including ADAMS. At this time ADAMS appears to be the most appropriate tool for the Center and a quote has been requested from the vendor.

Physics-based Simulation: The Site has reviewed MSC Nastran and Ansys and both software packages have been quoted by the vendors. The decision regarding which software to adopt is pending discussions with ABS regarding software they now use and validation of software other than what they use.

In addition to structure simulation, tools for simulation of resistance, seakeeping, and stability are being evaluated. Both commercial and public computational fluid dynamics codes are being reviewed.

Immersive Visualization: Division's dVise and dVS Tool Kit software have been evaluated and a request for approval for purchase has been submitted to the Center. This software supports all of the in-house display technologies as well as taking full advantage of the multiprocessor architecture of the ONYX.

Visual Simulation: The Paradigm Simulation's VEGA software has been reviewed and evaluated. At present, this software does not appear to be an appropriate tool for this facility and alternative animation and visualization software is being reviewed.

Ship's Lines and Naval Architecture: Various software packages for the purpose of carrying out course design iterations are being reviewed. So far AutoShip and ShipCAM have been reviewed and Nautilus and Fastship software packages are being reviewed.

5.2. Orange Site Projects

5.2.1. Technology Development

5.2.1.1. Regional

Development of billing software for a distributed computing environment is proposed. The way the Orange Site operates requires that the Site account for use of computer resources. This means that software must be obtained which will monitor CPU usage, network connection, storage, and other aspects of computer processes accessed by project researchers. This is complicated by a mixed-platform, mixed operating system environment.

Since software to efficiently carry out the above accounting is not commercially available, a proposal was sought from and was submitted by the Lamar University Computer Sciences Department. This proposal will be forwarded for Center approval after in-house approval. The estimated cost is less than $10,000.

5.2.1.2. National

Simulation of outfitting processes in new ship construction is proposed. In November 1994 the Orange Site developed and submitted a Stage II Problem Statement which addressed the need for improved outfitting of ships. The John Gray Institute (JGI) in cooperation with Managing Change Inc., and Avondale Shipbuilding have developed a proposal to address the problem. This proposal is currently under review and will be submitted by the end of July.

Simulation of steel assembly in new ship construction is proposed. The Orange Site has received a proposal from Babcock & Wilcox (a McDermott Company) for the Simulation Modeling of Critical Production Processes. This proposal was originally submitted in August 1993 to SP-8 and was approved as NSRP Project 8-94-1 but was not funded. This proposal is being revised and updated to make it more responsive to the GCRMTC mission.

5.2.2. Testing of Ships, Ship Systems, and Shipbuilding Technology Improvements

5.2.2.1. Regional

The project Ship Repair Business Process Improvement is in progress. This project was approved in late May and has been started. (see attached Progress Report as Appendix P)

5.2.2.2. National

The Agile Manufacturing System Demonstration project is in progress. Orincon Corporation, McDermott Shipbuilding, and Intergraph have been working on ARPA Project OCR-95-4107-U-0139 entitled Agile Manufacturing for Shipbuilding. This project requires a demonstration of collaboration from geographically distributed locations over the Internet.

In May, the Orange Site agreed to serve as a node in the collaboration demonstration. As there is no cost to the Orange Site over and above its normal operations, its participation serves as an opportunity to test its hardware, software, and network. The Site participation also allows staff to gain valuable experience.

The demonstration is currently scheduled for July 13, however this may be delayed to July 26 due to technical difficulties at the McDermott node and in Washington DC.

5.2.3. Education and Training of Shipbuilding Personnel

5.2.3.1. Regional

Monthly Executive Workshops (in process). The Orange Site has been holding monthly meetings with local industry representatives to acquaint them with programs, services, and facilities available here. The June meeting was held at the Orange facility and included a demonstration of our capabilities. Subsequent meetings will be co-sponsored by the Electronic Commerce Resource Center and held jointly as there is significant synergy between the two operations.

5.2.3.2. National

In support of the commitment to education of Shipbuilding and marine industry personnel, a summer internship program has been initiated. The first interns arrived and began work on June 26. Two graduate students from the University of Michigan will spend approximately three months at the Orange Site. These students will participate in evaluating 20 application software and support Orange Site work with regional ship builders and repairers.

The draft translation of the Japanese CIM Project Report is complete and is being edited and refined at present. The project should be completed by the end of July.

In May the Orange Site hosted the NSRP SP-9 Panel meeting. During that meeting it was agreed to use Site funds to support the SP-9 fiscal year 96 projects approved by the NSRP Executive Control Board.

5.2.4. Marketing Resources

5.2.4.1. Regional

The Ship Repair Market Study project was approved in June and is underway. (see attached Progress Report as Appendix Q)

5.2.4.2. National

The Marketing Resource Center Feasibility Study is in the development stage. The Orange Site request to obtain consulting services was approved by the Texas Governor's office in the last week of May. Subsequently, a Request for Proposal was published in the Texas Register as of June 16. The deadline for proposals is July 16, thirty days after its appearance in the Register. Proposals will be evaluated on the basis of qualifications and Lamar University procedures.

5.2.5. Simulation-Based Design

5.2.5.1. Regional

McDermott Shipbuilding has received approval for funding to develop a facility to build the stern and machinery spaces for ships. McDermott included the Orange Site in its project and has subsequently requested a proposal for the development of an associative model of the machinery space. The proposal has been submitted and is under review by McDermott.

In May, M. Rosenblatt & Son Naval Architects (MR&S) submitted a proposal to the Navy for the design of an at-sea rearming system for the vertical launch system. This proposal included the Orange Site and its simulation-based design facility. A letter of participation and a capabilities statement was submitted to MR&S. The MR&S proposal is currently under review by the Navy.

CDI included the Orange site and its simulation based design facility in its proposal to General Dynamics Electric Boat Division for engineering support on the Advanced Attack Submarine program. The Orange Site submitted a capabilities statement and rate schedule to CDI. CDI's proposal is under review by Electric Boat Division of General Dynamics.

Brown & Root has submitted a proposal to ARPA for the development of the Landing Ship Quay/Causeway (LSQ/C) and is working with Orange shipbuilding for fabrication and assembly. The Orange Site submitted a rate schedule and was included in Brown and Root's proposal. The Orange Site is also discussing development of a mechanical simulation of the proposed design to serve as a demonstration of simulation-based design and the Orange Site's capabilities.

The Orange Site's Simulation-Based Design facility has been included in the proposal for design and engineering of the mobile off-shore base system project. Further discussion of the Orange Site participation is pending award of the contract.

As a demonstration of immersive visualization, the Orange Site is developing an immersive model of the LPD-17. Intergraph has provided us with a 3D CAD model of the ship in IGES and Intergraph formats. These are currently being translated by Division as a demonstration of their conversion software. The converted model is expected to be available for demonstration by the end of July.

The Navy has located its minehunting capability at Ingleside, Texas. Local ship repairers are in a position to support the Navy's maintenance and overhaul needs. To test and demonstrate the use of visualization as a planning tool, the Orange Site requested a copy of the MCM Product Model developed by the Navy planning yard. When that model is delivered, it will be available for use by local ship repairers to support their estimating and planning process. The Orange Site also intends to convert the MCM Product Model for the purpose of demonstration and evaluation of immersive visualization as a planning tool.

5.2.6. Next Steps

5.2.6.1. Application of Electronic Commerce Technologies

There is significant opportunity for synergy and optimal use of resources for the Orange Site if the site's activities are coordinated with those of the Electronic Commerce Resource Center (ECRC). To this end, the site plans to pursue the following actions:

1) Become an NSnet and Internet resource for local ship builders, repairers, and suppliers.

2) Serve as a resource for the local marine industry base in using NSnet and the Internet to market services and provide rapid response to commercial and military needs. The Orange Site will strive to become a home page server for local marine industry to include ship repairers, ship owners, suppliers, and service providers. This will be accomplished with the assistance of the ECRC.

3) Participate in distributed collaborative design. The application of the software being developed under the ARPA Agile Manufacturing for Shipbuilding project to regional ship repairers is being discussed at present. Further discussions and a meeting with Orincon are planned.

5.2.6.2. Expand Industry Outreach Effort

The site will continue to interact with the local marine industry. The plans include continued representation at local industry forums and meetings with industry management.

The Orange Site had originally scheduled a workshop for mid-July, however this will be delayed until suitable demonstrations and applications are available. The workshop is tentatively rescheduled for September.

The Orange Site will continue to be represented by its personnel in national forums. As part of this commitment an abstract to SNAME for a paper/presentation at the 1996 Ship Production Symposium has been submitted. The site is working with its vendors to set up a demonstration booth at the symposium.

5.2.6.3. Continue Development of Center Resources

As the simulation-based design concept and architecture is further developed it has become apparent that there will be a need for on-site computational fluid dynamics simulation. Bandwidth and access limitations restrict use of off-site resources. Therefore, the site will be proposing the purchase of an SGI Power Challenge computer for the purpose of economically and efficiently running CFD simulations concurrently with other physics-based simulations.

5.2.6.4. Leverage Facility Resources to Benefit Education and Business

The Orange Site will continue to develop relationships with educational institutions and businesses, both regionally and nationally, to maximize the economic benefit of the technologies at the Orange Site. This will be achieved by meeting with representatives of business and educational institutions and opening discussion on partnerships in new research and education opportunities.

5.3. Administrative

5.3.1. Staffing

Project Coordinators: In a program budget review with the Center and the Government Program Manager in May the Project Coordinator line item was discussed. In that discussion, the Government Program Manager approved $250,000 per year for the purpose of funding staff to develop and manage new projects. Job descriptions are being developed for additional Orange Site personnel and open positions will be advertised nationally.

Researchers: The researcher positions will be filled as in-house projects are developed.

5.3.2. Budget and Expenditures

(see Figure 1, "Status of Budget and Expenditures Through the Third Quarter of Fiscal Year 1995")

5.3.3. Milestones

(see Figure 2, "Lamar Information Technologies Research Consortium")

6. INITIATION OF CENTERS

The GCRMTC was originally committed to initiating four Centers i.e. Simulation-Based Design Center, Shipbuilding Environmental Resource Center, Shipbuilding Process and Products Standards Center and a Marketing Resource Center. Based on the workshop held February 22-23, 1995 it was decided to table the Shipbuilding Process and Products Standards Center.

6.1 GCRMTC Environmental Resource Information Center

The activities conducted during the second quarter of 1995 by the GCRMTC Environmental Resource Information Center (ERIC) were directed at developing an infrastructure to address the environmental needs and regulatory impact on the ship building industry. Some of these were identified in the GCRMTC Workshop 95-1 held February 22-23, 1995. Included in the objectives of ERIC is the ability for rapid response to issues such as the currently pending OSHA standards for reducing the tolerance levels of hexavalent chromium air emissions. The following tasks were conducted in support of the environmental focus of ERIC as part of the internal mission of the GCRMTC:

1. Development of one year work plan for ERIC (budget and activities)

2. The Center has been asked to participate in a task force formed by NAVSEA to address the regulatory impact of a proposed OSHA Air Emission Standards. The task group has been established to formulate and execute a detailed plan of action to interface with OSHA personnel preparing a draft report, to present the Navy's position at public hearings, to assess the compliance methods necessary to cost effectively meet OSHA requirements and to define the magnitude of the economic, health and environmental problem. ERIC personnel are participating in the following activities:

   a. Establishing the project scope and tasks.

   b. Task Force Kick-Off meeting (April 27) and second meeting (May 24) in Arlington, VA at Westinghouse MTD.

   c. GCRMTC/ERIC project activities have been proposed to include laboratory testing, test evaluation and an analysis of the proposed test method.

   d. Developing a GCRMTC proposal for a phase 2, in-depth study on the issues of air emissions involving Cr^{+6}, MnO, and NiO with NAVSEA 03M and Newport News Shipbuilders, Inc.

3. Expanded the existing environmental database at UNO to include NSRP and other reports and projects.

a. Conducted literature search of all NSRP reports and publications.

b. Identified UNO's LaTAP (Louisiana Technical Assistance Program) resources that can be utilized by ERIC.

c. Established contact with NAVSEA environmental staff and available databases.

d. Prepared Technical Brief on Waste Reduction Alternatives for Painting and Coating.

4. Efforts were made to establish an effective government/industry relationships

a. Identified 80 shipyards and repair companies in Louisiana.

b. Attended and participated in NSRP SP-1 committee meeting activities in Jacksonville, Fla., June 1995.

c. Investigated interim information for electronic database system, including interactive modem interface.

The proposed activities for the next quarter include:

- Complete staffing plan for ERIC (job descriptions, search, etc.)
- Select electronic database system to serve long term needs
- Continue collection of selected reports and documents from, NSRP, EPA, etc.
- Maintain communication and activities with NSRP SP-1 committee
- Develop pollution prevention workshop for shipbuilding and repair industry with the LaTAP. Two workshops are planned for August 1995 (New Orleans and Lake Charles, LA). A review of these meetings will be made and used to develop a model for offering these workshops in other areas.
- Participation in national/international meetings to promote services and resources of benefit to U.S. shipbuilding.
- Assist in completing the first draft of a report responding to the proposed OSHA Standards for reducing the allowable hexavalent chromium levels via air emissions. Participate (if requested by NAVSEA) in public hearings concerning this issue. Develop an in-depth research proposal (in concert with NAVSEA and private ship yards) to fully address the issue of the reduced Cr^{+6} and, also, MnO and NiO emission levels.
- Continue to develop network with local and national associations representing various aspects of the shipbuilding and repair industry (mailing lists, publications, newsletters, etc.)

7. BUDGETS

7.1 Center and UNO Site Budget

Figure 3 depicts the budget from the Center and New Orleans Site which was approved by the Government Program Manager.

7.2 Orange Site Budget

Figure 4 depicts the Lamar Site budget approved by the Government Program Manager.

8. SUMMARY

The GCRMTC objectives and milestones as defined by the Cooperative Agreement continue to be met in a timely fashion. The achievements of the two sites and the Center during the second quarter of 1995 were as follows:

1) Nearly all staff positions at both sites and the Center have been filled.

2) The infrastructure buildup at both sites and the Center consisting of renovations of facilities and acquisition of research equipment, computer hardware and software is nearing completion.

3) The Government/Industry Advisory Board was formed and met at the New Orleans Site on May 4, 1995 to give guidance and direction to the GCRMTC. The Board reviewed nearly 100 Stage II problem statements and based on their recommendations requests for proposals have been prepared and will be issued.

4) Research projects were initiated at both sites and are fully operational at present. Status reports of 15 research projects are appended. Each research project is in collaboration with shipbuilding/marine industry partners.

5) The Center initiated the Environmental Resources and Information Center (ERIC) which is colocated at the New Orleans Site. ERIC will be a depository and resource for environmental issues of concern to the shipbuilding industries.

6) The Orange Site has completed its Simulation-Based Design Facility at Orange, Texas. The Silicon Graphics workstations and considerable associated software have been purchased and are operational.

7) Budget projections for FY95-99 are included for both sites and the Center and include both in-house and sub-contracted research project expenditures.

9. RECOMMENDATIONS

Based on a review of the April 1, 1995 to June 30, 1995 activities of the Center and the New Orleans and Orange Sites along with the feedback from the Program Manager and Staff, the following actions are recommended:

1) Issue an RFP for the five research projects recommended by the GIAB and approved by the Government Program Manager. Receive responses and commence evaluation.

2) Commence a second round of Problem Statement solicitations leading to subcontract awards in spring 1996.

3) Initiate plans for a Government Industry Advisory Board Meeting in early November 1995.

4) Participate in a Conference Exposition in Charleston, South Carolina in September 1995.

5) Host a welding workshop at UNO in October 1995.

6) Host a meeting in October 1995 at UNO between the Government Program Manager and UNO Principal Investigators.

FIGURES:

FIGURE 1 - STATUS OF BUDGET AND EXPENDITURES THROUGH THE THIRD QUARTER OF FISCAL YEAR 1995

FIGURE 2 - LAMAR INFORMATION TECHNOLOGIES RESEARCH CONSORTIUM

FIGURE 3 - GCRMTC CENTER AND NEW ORLEANS SITE PLANNING BUDGET FY95-99

FIGURE 4 - GCRMTC LAMAR SITE PLANNING BUDGET FY95-9

Status of Budget and Expenditures Through the Third Quarter of Fiscal Year 1995

Through the end of the third quarter, the Orange Site expenditures were well within its appropriated funds. As the facility and staff mature into the roles necessary to execute its comprehensive goals as defined in the statement of work, the budgetary requirements of the site has becomes more clearly focused. In order to fulfill the best intentions of our mission, a reallocation of funds will be formally requested within the site's budget categories at a later date.

The table below is a snapshot of the fiscal condition through the end of the third quarter:

Table 1: GCRMTC-LU: Fiscal Operations

Budget Category	Approved Amount	Expenditure to Date	Projected 4th Qtr	Projected Remaining Balance	To Be Requested Budget Adjustment	Revised Budget
Administration:						
Salaries	$ 541,721	$ 215,887	$ 150,318	$ 175,516	$ (175,516)	$ 366,205
Operations	$ 143,113	$ 84,827	$ 58,286	$ -		$ 143,113
Sub-total	$ 684,834	$ 300,715	$ 208,604	$ 175,516	$ (175,516)	$ 509,318
Infrastructure:						
Building (incl. Architect)	$ 522,719	$ 496,693	$ 27,680	$ (1,654)	$ 1,654	$ 524,373
Equipment	$ 2,216,667	$ 1,592,224	$ 624,443	$ -	$ 173,862	$ 2,390,529
Sub-total	$ 2,739,386	$ 2,088,917	$ 652,123	$ (1,654)	$ 175,516	$ 2,914,902
Marketing Resource Center:						
Feasibility Study	$ 110,000	$ -	$ 36,000	$ 74,000		$ 110,000
Sub-total	$ 110,000	$ -	$ 36,000	$ 74,000	$ -	$ 110,000
Workshops:						
Maintenance & Operations	$ 10,000	$ 713	$ 9,287	$ -		$ 10,000
Sub-total	$ 10,000	$ 713	$ 9,287	$ -	$ -	$ 10,000
General & Administration:						
G & A Fee	$ 344,522	$ 181,823	$ 162,699	$ -		$ 344,522
Sub-total	$ 344,522	$ 181,823	$ 162,699	$ -	$ -	$ 344,522
In-House Projects:						
Research & Projects	$ 381,153	$ 9,928	$ 87,375	$ 283,850		$ 381,153
Sub-total	$ 381,153	$ 9,928	$ 87,375	$ 283,850	$ -	$ 381,153
Sub-Contracted Projects:						
Research & Projects	$ 381,153		$ 65,000	$ 316,153		$ 381,153
Sub-total	$ 381,153	$ -	$ 65,000	$ 316,153	$ -	$ 381,153
GRAND TOTAL	$ 4,651,048	$ 2,582,096	$ 1,221,087	$ 847,865	$ 0	$ 4,651,048

Figure 1 - Status of Budget and Expenditures through the Third Quarter of Fiscal Year 1995

Administration - the site projects a savings of $ 175,716 in fully burdened salaries through the end of the quarter; these savings occurred as a result of the timing of staffing increments . There is an expectation that the site will have its full complement of staff by the middle of the fourth quarter. The Orange Site will formally propose to use these savings to partially fund the purchase of an SGI Power Challenge mini supercomputer to support simulation.

Infrastructure - except for a slight variance in the building construction cost, expenditures are in line with budget; as indicated above a budget modification will be formally requested to accommodate the purchase of the SGI mini super-computer.

Marketing Resource Center - the Orange Site projects a carryover balance of $ 74,000 that will be fully expended in the next fiscal year.

Workshops - expenditure and budget are projected to be in line.

General & Administration Fee - subject to internal approval, the Orange Site will seek to use unearned general and administration fees to request a budget modification to (partially) fund the SGI mini supercomputer.

In-House Projects - the balances projected at the end of the quarter will be carried forward to complete the funding of current and anticipated projects.

Sub-Contracted Projects - the balances projected at the end of the quarter will be carried forward to fund future projects.

Figure 1 - Status of Budget and Expenditures through the Third Quarter of Fiscal Year 1995 - (continued)

Figure 1 - Status of Budget and Expenditures through the Third Quarter of Fiscal Year 1995 - (continued)

	VENDOR	ITEM	QTY	ACTUAL COST	PROJECTED COST	P.O. #	ACCT #	DoP
Computer Systems/Periphals	Silicon Graphics	SGI ONYX	1	$ 1,047,694.25	$ 1,051,550.00	L505814-C0.01	RG-6-30130-5416	3/30/95
	Silicon Graphics	SGI Indigo 2 Extreme & Periph.	3	$ 83,272.00	$ 91,147.00	L505816	RG-6-30130-5416	2/28/95
	Silicon Graphics	SGI Indigo 2 XZ	1	$ 19,510.60	$ 22,135.00	L505817	RG-6-30130-5416	2/28/95
	Silicon Graphics	SGI Indy's	4	$ 40,189.50	$ 50,689.50	L505818-C0.01	RG-6-30130-5416	3/6/95
	Silicon Graphics	SGI Indy (DNS Server)	1	$ 6,021.60		L506733	RG-6-30130-5416	3/28/95
	Silicon Graphics	RAID System	1	$ 44,470.75		No Approval Yet		
	AVC3	3D Projection System	1	$ 121,862.28	$ 200,000.00	L506651	RG-6-30130-5416	3/27/95
	Fakespace, Inc.	BOOM 3C	1	$ 111,900.00	$ 150,000.00	L506144 L506815	RG-6-30130-5416 RG-6-30130-5416	3/9/95 3/30/95
	Division, Inc.	HMD / Tracker/ Controller	1	$ 25,424.69		No Approval Yet		
		SUN/HP/DEC/IBM			$ 280,000.00			
		PC's for staff	5		$ 35,000.00			
		CD-ROM Burner	1		$ 3,000.00			
	Engineered Computer Rooms	UPS for ONYX , W.S. and Rack	9	$ 19,950.00	$ 17,000.00	L507112	RG-6-30130-5416	3/17/95
	Hewlett Packard	HP Computers	2	$ 59,663.70		No Approval Yet		
	Hewlett Packard	HP Computers	1	$ 4,502.40		No Approval Yet		
	Digital Comp. Associates	HP Memory Upgrade	4	$ 18,380.00		No Approval Yet		
Hardware Total				$ 1,602,841.57				
Networking Components	Southwestern Bell	Internal Cabling	1	$ 20,189.95	$ 50,000.00	L506652	RG-6-30130-5416	3/27/95
	Fore Systems	Network Hardware	1	$ 92,104.00	$ 95,000.00	L506659	RG-6-30130-5416	3/27/95
	Fore Systems	Network Hardware	1	$ 1,736.00		L509312	RG-6-30130-5416	6/15/95
	Fore Systems	Network Hardware	1	$ 4,177.00		Frozen		
	Southwestern Bell	Internet T-1 Line Org-Bmt 5 mo.	5	$ 4,819.50		L506639	RG-6-30130-3431	3/27/95
	MCI	Internet T-1 Line Bmt-Hst 5 mo.	5	$ 5,105.00		L506663	RG-6-30130-3431	3/27/95
	Southwestern Bell	Internet T-1 Line Hst-MDA 5 mo.	5	$ 3,368.50		L506641	RG-6-30130-3431	3/27/95
	Univ. of Texas @ Austin	THEnet Fee thru August	5	$ 500.00		L506637	RG-6-30130-3431	3/27/95
	Anixter Bros.	Larsecom CSU/DSU	2	$ 4,410.00		L506549	RG-6-30130-5416	3/24/95
	Anixter Bros.	Cabling Supplies	1	$ 646.00		L506704	RG-6-30130-3433	3/28/95
	Anixter Bros.	Cabling Supplies	1	$ 3,380.00		L506816	RG-6-30130-3433	3/30/95
	Anixter Bros.	Hubs and Cables	1	$ 2,444.00		L507457	RG-6-30130-5416	4/20/95
	Larsecom, Inc.	Cables	1	$ 130.00		L508133	RG-6-30130-5416	5/9/95
	Sabre' Data	Cisco 2511 & Periph	1	$ 4,466.50		L506655	RG-6-30130-5416	3/27/95
	Sabre' Data	Octopus Cables	2	$ 510.00		L506844	RG-6-30130-5416	3/31/95
	Computer Dimensions	Transciever for Apple's	2	$ 138.00		L509461	RG-6-30130-5416	6/19/95
	Sabre' Data	Modems for Network	4	$ 2,716.60		No Approval Yet		
Network Total				$ 150,741.05				

Figure 1 - Status of Budget and Expenditures through the Third Quarter of Fiscal Year 1995 - (continued)

Software		CAD Software			$ 150,000.00			
	Silicon Graphics	IRIS Varsity Program	1	$ 10,975.00		L507380	RG-6-30130-5416	4/17/95
	Engineering Cybernetics, Inc.	ADAMS Package	1	$ 36,432.00		No Approval Yet		
	Division, Inc.	dVISE VR Software	1	$ 12,187.50		No Approval Yet		
	Parametric Technology Corp.	ProEngineer	2	$ 29,260.00		No Approval Yet		
Software Total				$ 88,854.50				
Miscellaneous					$ 60,000.00			
	Vinay Saxena	Tape for backup @ training	1	$ 18.99			RG-6-30130-3160	4/27/95
	VanStar	WYSE ASCII Terminals	2	$ 590.00		L509301	RG-6-30130-5416	6/15/95
	VanStar	Tapes for backups	24	$ 294.00		L509304	RG-6-30130-3160	6/15/95
	Sabre Data	Cisco Configuration Builder	1	$ 495.00		L509305	RG-6-30130-5416	6/15/95
	Falcon Systems	Second Hard Drives for Indy's	4	$ 4,524.00		L509303	RG-6-30130-5416	6/15/95
	Specialized Products	Toolkit	1	$ 942.00		L509315		6/15/95
	Silicon Graphics	SGI CBT Training		$ 10,444.50		L508736	RG-6-30139-3142	3/28/95
	Silicon Graphics	SGI Training Off-site		$ 12,025.00		L505219-CO 01	RG-6-30130-3142	3/10/95
	Hewlett Packard	System Management Training	4	$ 6,340.00		No Approval Yet		
	Division, Inc.	dVISE Training	2	$ 9,000.00		No Approval Yet		
Miscellaneous Total				$ 44,673.49				
Grand Total				$ 1,887,110.61	$ 2,255,521.50			
		Total Allocated 8/94-8/95		$ 2,216,338.00				
		Remaining Balance		$ 329,227.39				
	Purchase priorities with remaining balance:		1. MSC Nastran					
			2. CFD Software					
			3. AutoCAD					
			4. AutoShip/FastShip					
			5. Intergraph					
			6. DEC Hardware					
			7. IBM Hardware					

Lamar Information Technologies Research Consortium
Action Items

DATE	DIVISION	ISSUE	REQUIRED ACTION	DATE COMPLETED
	GCRMTC-LU	Development of Computer Network Billing Software		
06/95			Discussion w/LU Beaumont	06/95
07/95			proposal development	
07/95			in-house proposal review	
07/95			proposal revisions	
07/95			forwarding for GPM approval	
08/95			project start	
		Simulation of Outfitting Processes in New Ship Construction		
12/94			phase II problem statement	12/94
03/95			discussion w/LU JGI and proposers	03/95
07/95			proposal development	
07/95			in-house proposal review	
07/95			proposal revisions	
08/95			forwarding for GPM approval	
08/95			project start	
08/96			project complete	
		SP-8 Project Sponsorship		
08/95			request for proposal	
09/95			proposal review	
10/95			proposal revisions	
10/95			forwarding for GPM approval	

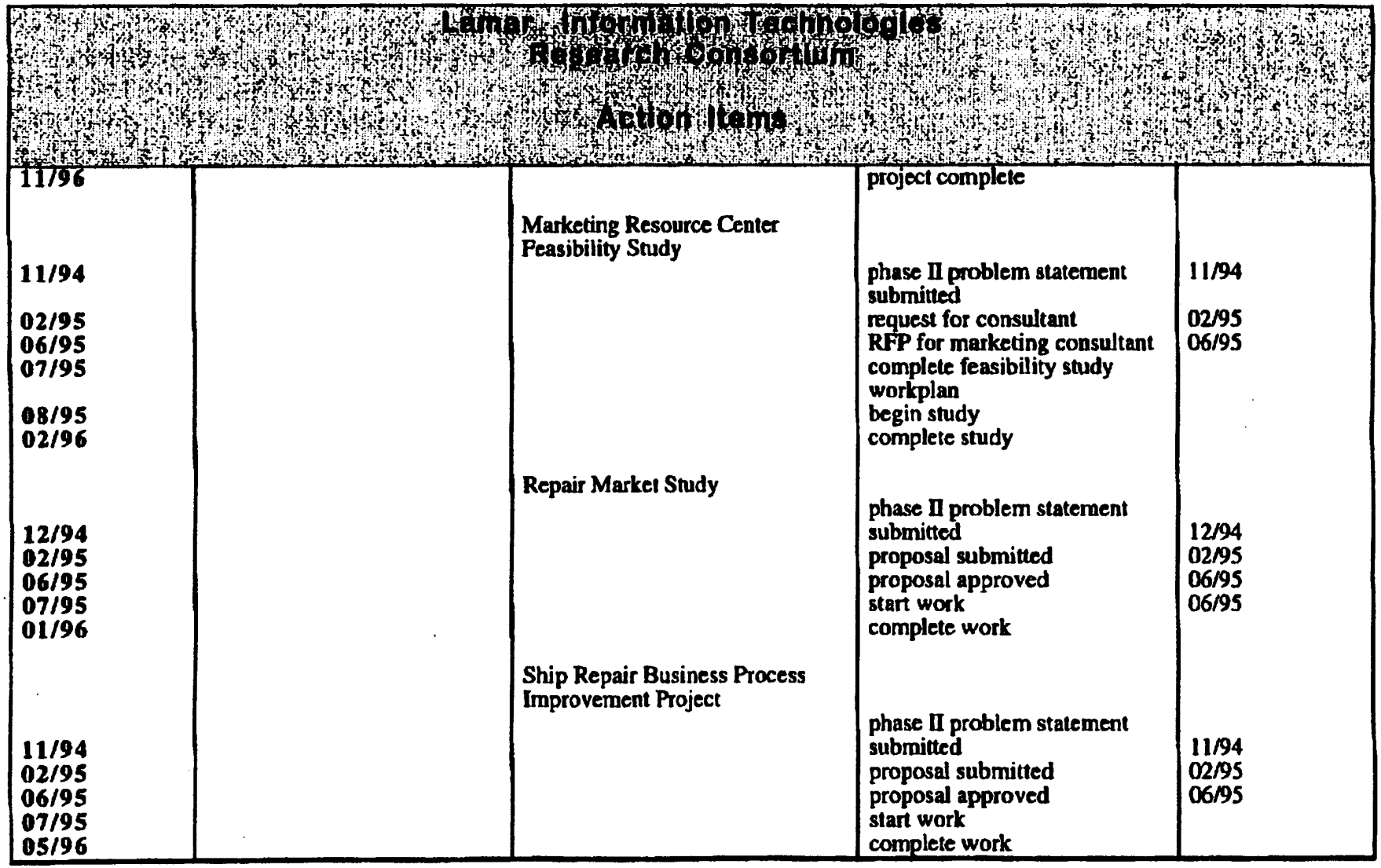
Figure 2 - Lamar Information Technologies Research Consortium

Lamar Information Technologies Research Consortium

Action Items

11/95			project start	
11/96			project complete	
		SP-4 Project Sponsorship		
08/95			request for proposal	
09/95			proposal review	
10/95			proposal revisions	
10/95			forwarding for GPM approval	
11/95			project start	
11/96			project complete	
		Orincon ARPA Project		
05/95			request for participation	05/95
06/95			provide access to network	06/95
06/95			preliminary demonstration	
07/13/95			final demonstration	
		Summer Intern Program		
05/95			students recruited	05/95
06/26/95			start of work	06/6/95
08/31/95			end of work	
		SP-9 Project Sponsorship		
08/95			request for proposal	
09/95			proposal review	
10/95			proposal revisions	
10/95			forwarding for GPM approval	
11/95			project start	

Figure 2 - Lamar Information Technologies Research Consortium - (continued)



Lamar Information Technologies Research Consortium

Action Items

11/96			project complete	
		Marketing Resource Center Feasibility Study		
11/94			phase II problem statement submitted	11/94
02/95			request for consultant	02/95
06/95			RFP for marketing consultant	06/95
07/95			complete feasibility study workplan	
08/95			begin study	
02/96			complete study	
		Repair Market Study		
12/94			phase II problem statement submitted	12/94
02/95			proposal submitted	02/95
06/95			proposal approved	06/95
07/95			start work	06/95
01/96			complete work	
		Ship Repair Business Process Improvement Project		
11/94			phase II problem statement submitted	11/94
02/95			proposal submitted	02/95
06/95			proposal approved	06/95
07/95			start work	
05/96			complete work	

Figure 2 - Lamar Information Technologies Research Consortium - (continued)

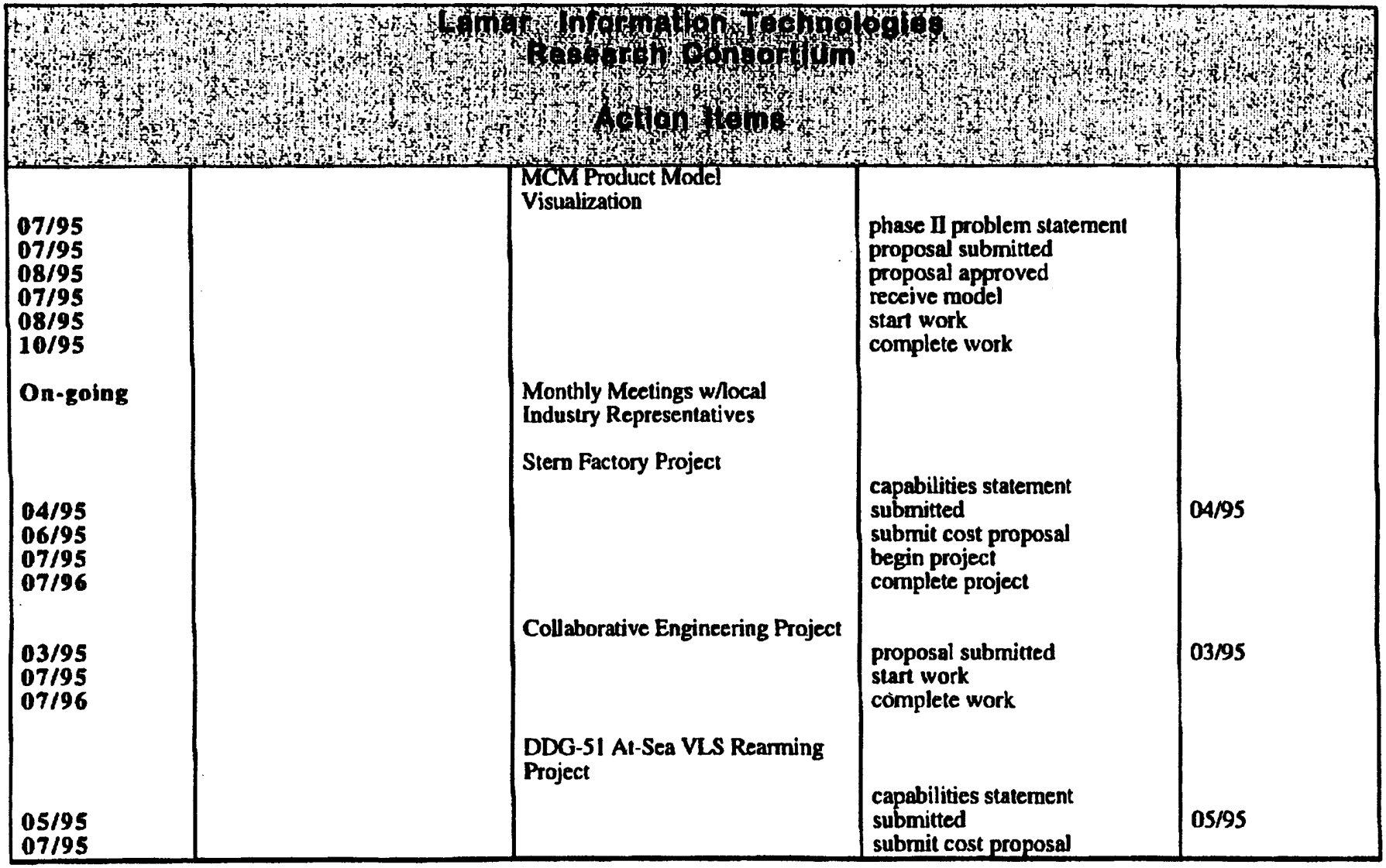


Figure 2 - Lamar Information Technologies Research Consortium - (continued)

Lamar Information Technologies Research Consortium

Action Items

08/95 08/96			begin project complete project	
		CDI Engineering Support for Advanced Attack Submarine Design		
05/95 07/95 08/95 08/96			capabilities statement submitted submit cost proposal begin project complete project	05/95
		Application of SBD to LSQC Program		
06/95 07/95 08/95 08/96			see schedules submitted submit cost proposal begin project complete project	06/95
		LPD-17 Product Model Visualization		
07/95 08/95 09/95 07/95 09/95 09/96			phase II problem statement proposal submitted proposal approved receive model start work complete work	

Figure 2 - Lamar Information Technologies Research Consortium - (continued)

GULF COAST REGION MARITIME TECHNOLOGY CENTER
CENTER AND NEW ORLEANS SITE PLANNING BUDGET-FY95-96

		Fiscal Year 1995				Fiscal Year 1996			
		UNO Site and Center				UNO Site and Center			
Funding Appropriations		QI - FY 95	QII - FY 95	QIII - FY95	QIV - FY 95	QI - FY 96	QII - FY 96	QIII - FY 96	QIV - FY 96
And Increments		Oct - Dec 94	Jan - Mar 95	Apr - Jun 95	Jul - Sep 95	Oct - Dec 95	Jan - Mar 96	Apr - Jun 96	Jul - Sep 96
	Totals								
FY 93	*$4,220,242*	$2,300,000	$640,080	$640,081	$640,081				
FY 94	*$571,330*			$571,330					
FY 95	*$3,500,000*					$3,500,000			
FY 96	*$0*								
FY 97	*$0*								
FY 98	*$0*								
FY 99	*$0*								
Internal Obligations	***Totals***								
Administration	*$989,250*	$42,580	$170,890	$127,890	$127,890	$130,000	$130,000	$130,000	$130,000
Infrastructure	*$250,000*		$125,000			$10,000	$65,000		$50,000
Professional Services	*$23,520*					$11,760		$11,760	
Environmental Center	*$673,375*			$50,000	$124,675	$124,675	$124,675	$124,675	$124,675
Education/Training	*$15,000*				$5,000		$5,000		$5,000
Workshop	*$56,400*		$14,100		$14,100		$14,100		$14,100
LU 3% Administration	*$246,720*	$34,035	$34,035	$34,035	$34,035	$27,645	$27,645	$27,645	$27,645
Sub-Total	*$2,254,265*	$76,615	$344,025	$211,925	$305,700	$304,080	$366,420	$294,080	$351,420
In-House Projects	***Totals***								
Jan - Dec 95	*$2,665,287*		$1,233,237	$477,350	$477,350	$477,350			
Jul95-Jun96	*$700,000*				$400,000	$100,000	$100,000	$100,000	
Jan96-Dec96	*$922,335*						$300,000	$300,000	$322,335
Jul96-Jun97	*$0*								
Jan97-Dec97	*$0*								
Jul97-Jun98	*$0*								
Jan98-Dec98	*$0*								
Jul98-Jun99	*$0*								
Jan99-Dec99	*$0*								
Jul99-Jun00	*$0*								
Sub-Total	*$4,287,622*		$1,233,237	$477,350	$877,350	$577,350	$400,000	$400,000	$322,335
Subcontracted Projects	***Totals***								
Jan 95 NDBL	*$100,000*			$25,000	$25,000	$25,000	$25,000		
Oct95-Sep96	*$824,842*					$824,842			
Apr96-Mar97	*$824,843*							$824,843	
Oct96-Sep97	*$0*								
Apr97-Mar98	*$0*								
Oct97-Sep98	*$0*								
Apr98-Mar99	*$0*								
Oct98-Sep99	*$0*								
Apr99-Mar00	*$0*								
Sub-Total	*$1,749,685*			$25,000	$25,000	$849,842	$25,000	$824,843	$0
Totals		$76,615	$1,577,262	$714,275	$1,208,050	$1,731,272	$791,420	$1,518,923	$673,755
Funding Balance		$2,223,385	$1,286,203	$1,783,339	$1,215,370	$2,984,098	$2,192,678	$673,755	$0
Industry	***Totals***								
Collaboration Revenues	*$1,000,000*			$100,000	$100,000	$200,000	$200,000	$200,000	$200,000
Expenditures	*$1,000,000*			$100,000	$100,000	$200,000	$200,000	$200,000	$200,000

Figure 3 - GCRMTC Center and New Orleans Site Planning Budget FY95-99

GULF COAST REGION MARITIME TECHNOLOGY CENTER
CENTER AND NEW ORLEANS SITE PLANNING BUDGET-FY97-99

		Fiscal Year 1997				Fiscal Year 1998				Fiscal Year 1999			
		UNO Site and Center				UNO Site and Center				UNO Site and Center			
Funding Appropriations		QI - FY 97	QII - FY 97	QIII - FY 97	QIV - FY 97	QI - FY 98	QII - FY 98	QIII - FY 98	QIV - FY 98	QI - FY 99	QII - FY 99	QIII - FY 99	QIV - FY 99
And Increments		Oct - Dec 96	Jan - Mar 97	Apr - Jun 97	Jul - Sep 97	Oct - Dec 97	Jan - Mar 98	Apr - Jun 98	Jul - Sep 98	Oct - Dec 98	Jan - Mar 99	Apr - Jun 99	Jul - Sep 99
	Totals												
FY 93	*$4,220,242*												
FY 94	*$571,330*												
FY 95	*$3,500,000*												
FY 96	*$5,000,000*	$5,000,000											
FY 97	*$5,000,000*					$5,000,000							
FY 98	*$5,000,000*									$5,000,000			
FY 99	*$0*												
Internal Obligations	*Totals*												
Administration	*$2,549,250*	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000
Infrastructure	*$380,000*	$65,000		$65,000									
Professional Services	*$94,080*	$11,760		$11,760		$11,760		$11,760		$11,760		$11,760	
Environmental Center	*$2,169,475*	$124,675	$124,675	$124,675	$124,675	$124,675	$124,675	$124,675	$124,675	$124,675	$124,675	$124,675	$124,675
Education/Training	*$45,000*		$5,000		$5,000		$5,000		$5,000		$5,000		$5,000
Workshop	*$141,000*		$14,100		$14,100		$14,100		$14,100		$14,100		$14,100
LU 3% Administration	*$576,720*	$7,500	$7,500	$7,500	$7,500	$37,500	$37,500	$37,500	$37,500	$37,500	$37,500	$37,500	$37,500
Sub-Total	*$5,955,525*	$338,935	$281,275	$338,935	$281,275	$303,935	$311,275	$303,935	$311,275	$303,935	$311,275	$303,935	$311,275
In-House Projects	*Totals*												
Jan - Dec 95	*$2,665,287*												
Jul95-Jun96	*$700,000*												
Jan96-Dec96	*$1,222,335*	$300,000											
Jul96-Jun97	*$800,000*	$200,000	$200,000	$200,000	$200,000								
Jan97-Dec97	*$800,000*		$200,000	$200,000	$200,000	$200,000							
Jul97-Jun98	*$779,790*				$179,790	$200,000	$200,000	$200,000					
Jan98-Dec98	*$1,200,000*						$300,000	$300,000	$300,000	$300,000			
Jul98-Jun99	*$984,790*								$184,790	$300,000	$250,000	$250,000	
Jan99-Dec99	*$750,000*										$250,000	$250,000	$250,000
Jul99-Jun00	*$34,790*												$34,790
Sub-Total	*$9,936,992*	$500,000	$400,000	$400,000	$579,790	$400,000	$500,000	$500,000	$484,790	$600,000	$500,000	$500,000	$284,790
Subcontracted Projects	*Totals*												
Jan 95 NDBL	*$100,000*												
Oct95-Sep96	*$824,842*												
Apr96-Mar97	*$824,843*												
Oct96-Sep97	*$939,895*	$939,895											
Apr97-Mar98	*$939,895*			$939,895									
Oct97-Sep98	*$942,395*					$942,395							
Apr98-Mar99	*$942,395*							$942,395					
Oct98-Sep99	*$942,395*									$942,395			
Apr99-Mar00	*$942,395*											$942,395	
Sub-Total	*$7,399,055*	$939,895	$0	$939,895	$0	$942,395	$0	$942,395	$0	$942,395	$0	$942,395	$0
Totals		$1,778,830	$681,275	$1,678,830	$861,065	$1,646,330	$811,275	$1,746,330	$796,065	$1,846,330	$811,275	$1,746,330	$596,065
Funding Balance		$3,221,170	$2,539,895	$861,065	$0	$3,353,670	$2,542,395	$796,065	$0	$3,153,670	$2,342,395	$596,065	$0
Industry	*Totals*												
Collaboration Revenues	*$5,800,000*	$300,000	$300,000	$300,000	$300,000	$400,000	$400,000	$400,000	$400,000	$500,000	$500,000	$500,000	$500,000
Expenditures	*$5,800,000*	$300,000	$300,000	$300,000	$300,000	$400,000	$400,000	$400,000	$400,000	$500,000	$500,000	$500,000	$500,000

Figure 3 - GCRMTC Center and New Orleans Site Planning Budget FY95-99 - (continued)

GULF COAST REGION MARITIME TECHNOLOGY CENTER
LAMAR SITE PLANNING BUDGET-FY95-96

			Fiscal Year 1995				Fiscal Year 1996		
			LUO Site				LUO Site		
Funding Appropriations		QI-FY 95	QII-FY 95	QIII-FY 95	QIV-FY 95	QI-FY 96	QII-FY 96	QIII-FY 96	QIV-FY 96
And Increments		Oct-Dec 94	Jan-Mar 95	Apr-Jun 95	Jul-Sep 95	Oct-Dec 95	Jan-Mar 96	Apr-Jun 96	Jul-Sep 96
	Totals								
FY 93	$4,401,758	$61,168	$271,864	$2,857,194	$1,211,532				
FY 94	$3,575,420				$3,575,420				
FY 95	$1,000,000					$1,000,000			
FY 96	$5,000,000								
FY97	$5,000,000								
FY98	$5,000,000								
Internal Expenditures	**Totals**								
Administration	$4,701,254	$34,137	$126,555	$266,029	$258,113	$241,744	$241,744	$241,744	$241,744
Infrastructure	$4,039,386	$22,500	$125,171	$2,241,715	$350,000	$81,250	$81,250	$81,250	$81,250
Marketing Resource Ctr	$686,076	$0	$0	$55,000	$55,000	$36,004	$36,005	$36,005	$36,005
Workshop	$50,000				$10,000				$10,000
General & Administration	$1,776,087	$4,531	$20,138	$211,644	$108,209	$154,975	$63,156	$56,532	$45,791
Sub-Totals	$11,252,803	$61,168	$271,864	$2,774,388	$781,322	$513,973	$422,155	$415,531	$414,790
In-House Projects	**Totals**								
Jan95-Dec95	$331,224			$82,806	$82,806	$82,806	$82,806		
Jul95-Jun96	$862,164				$215,541	$215,541	$215,541	$215,541	
Jan96-Dec96	$528,428						$132,107	$132,107	$132,107
Jul96-Jun97	$285,136								$71,284
Jan97-Dec97	$1,233,727								
Jul97-Jun98	$1,233,727								
Jan98-Dec98	$333,462								
Jul98-Jun99	$333,462								
Jan99-Dec99	$1,220,855								
Sub-Totals	$6,362,190	$0	$0	$82,806	$298,347	$298,347	$430,454	$347,648	$203,391
Subcontracted Projects	**Totals**								
Jan95-Dec95	$381,153				$381,153				
Oct95-Sep96	$1,279,840					$1,279,840			
Apr96-Mar97	$0								
Oct96-Sep97	$1,579,685								
Apr97-Mar98	$0								
Oct97-Sep98	$1,567,190								
Apr98-Mar99	$0								
Oct98-Sep99	$1,554,322								
Apr99-Mar00	$0								
Sub-Totals	$6,362,190	$0	$0	$0	$381,153	$1,279,840	$0	$0	$0
GRAND TOTAL	$23,977,177	$61,168	$271,864	$2,857,194	$1,460,822	$2,092,160	$852,609	$763,179	$618,181
Funding Balance		**$0**	**$0**	**$0**	**$3,326,130**	**$2,233,970**	**$1,381,361**	**$618,182**	**$0**
Industry	Totals								
Collaboration Revenues	$1,940,000					$30,000	$30,000	$30,000	$50,000
Expenditures	$1,940,000					$30,000	$30,000	$30,000	$50,000

Figure 4 - GCRMTC Lamar Site Planning Budget FY95-99

GULF COAST REGION MARITIME TECHNOLOGY CENTER
LAMAR SITE PLANNING BUDGET-FY97-99

		Fiscal Year 1997				Fiscal Year 1998				Fiscal Year 1999			
			LUO Site				LUO Site				LUO Site		
Funding Appropriations		QI-FY 97	QII-FY 97	QIII-FY 97	QIV-FY 97	QI-FY 98	QII-FY 98	QIII-FY 98	QIV-FY 98	QI-FY 99	QII-FY 99	QIII-FY 99	QIV-FY 99
And Increments		Oct-Dec 96	Jan-Mar 97	Apr-Jun 97	Jul-Sep 97	Oct-Dec 97	Jan-Mar 98	Apr-Jun 98	Jul-Sep 98	Oct-Dec 98	Jan-Mar 99	Apr-Jun 99	Jul-Sep 99
	Totals												
FY 93	$4,401,758												
FY 94	$3,575,420												
FY 95	$1,000,000												
FY 96	$5,000,000	$5,000,000											
FY97	$5,000,000					$ 5,000,000							
FY98	$5,000,000									$5,000,000			
Internal Expenditures	Totals												
Administration	$4,701,254	$247,810	$247,810	$247,810	$247,810	$254,058	$254,058	$254,058	$254,058	$260,493	$260,493	$260,493	$260,493
Infrastructure	$4,039,386	$81,250	$81,250	$81,250	$81,250	$81,250	$81,250	$81,250	$81,250	$81,250	$81,250	$81,250	$81,250
Marketing Resource Ctr	$686,076	$36,004	$36,005	$36,005	$36,005	$36,004	$36,005	$36,005	$36,005	$36,004	$36,005	$36,005	$36,005
Workshop	$50,000				$10,000				$10,000				$10,000
General & Administration	$1,776,087	$171,851	$59,582	$59,582	$79,354	$204,429	$61,049	$61,049	$43,844	$167,904	$69,445	$69,445	$63,576
Sub-Totals	$11,252,803	$536,915	$424,647	$424,647	$454,419	$575,741	$432,362	$432,362	$425,157	$545,651	$447,193	$447,193	$451,324
In-House Projects	Totals												
Jan95-Dec95	$331,224												
Jul95-Jun96	$862,164												
Jan96-Dec96	$528,428	$132,107											
Jul96-Jun97	$285,136	$71,284	$71,284	$71,284									
Jan97-Dec97	$1,233,727		$308,432	$308,432	$308,432	$308,432							
Jul97-Jun98	$1,233,727				$308,432	$308,432	$308,432	$308,432					
Jan98-Dec98	$333,462						$83,366	$83,366	$83,366	$83,366			
Jul98-Jun99	$333,462								$83,366	$83,366	$83,366	$83,366	
Jan99-Dec99	$1,220,855										$406,952	$406,952	$406,952
Sub-Totals	$6,362,190	$203,391	$379,716	$379,716	$616,864	$616,864	$391,797	$391,797	$166,731	$166,731	$490,317	$490,317	$406,952
Subcontracted Projects	Totals												
Jan95-Dec95	$381,153												
Oct95-Sep96	$1,279,840												
Apr96-Mar97	$0												
Oct96-Sep97	$1,579,685	$1,579,685											
Apr97-Mar98	$0												
Oct97-Sep98	$1,567,190					$1,567,190							
Apr98-Mar99	$0												
Oct98-Sep99	$1,554,322									$1,554,322			
Apr99-Mar00	$0												
Sub-Totals	$6,362,190	$1,579,685	$0	$0	$0	$1,567,190	$0	$0	$0	$1,554,322	$0	$0	$0
GRAND TOTAL	$23,977,177	$2,319,991	$804,363	$804,363	$1,071,283	$2,759,795	$824,159	$824,159	$591,888	$2,266,704	$937,510	$937,510	$858,276
Funding Balance		$2,680,009	$1,875,646	$1,071,283	$0	$2,240,206	$1,416,047	$591,888	$0	$2,733,296	$1,795,786	$858,276	$0
Industry	Totals												
Collaboration Revenues	$1,940,000	$50,000	$90,000	$130,000	$150,000	$150,000	$150,000	$180,000	$180,000	$180,000	$180,000	$180,000	$180,000
Expenditures	$1,940,000	$50,000	$90,000	$130,000	$150,000	$150,000	$150,000	$180,000	$180,000	$180,000	$180,000	$180,000	$180,000

Figure 4 - GCRMTC Lamar Site Planning Budget FY95-99 - (continued)

APPENDIX A

GOVERNMENT/INDUSTRY ADVISORY BOARD MEETING

University of New Orleans
New Orleans, LA 70148

GOVERNMENT INDUSTRY ADVISORY BOARD MEETING 5/4/95

Mr. Amos Baki
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2341 Jefferson Davis Highway
Suite 500
Arlington VA 22202
Phone: 703-415-7880/ Fax: 703-415-7828

Mr. Bruce Bongiorni
Gulf Coast Region Maritime Technology Center, Lamar University
410 Front Street
Orange TX 77630
Phone: 409-882-3060/ Fax: 409-882-3070

Dr. John N. Crisp
Executive Director, Gulf Coast Region Maritime Technology Center
University of New Orleans, College of Engineering, Room EN 212
Lakefront
New Orleans LA 70148
Phone: 504-286-3871/ Fax: 504-286-3898

Mr. Andrew Dallas
Office of Naval Research
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Balston Towers #1
Arlington VA 22217-5660
Phone: 703-696-4448/ Fax:

Mr. Robert P. Draim
Executive Director, Engineering, Naval Sea Systems Command
Department of the Navy
2531 Jefferson Davis Highway
Arlington VA 22242-5160
Phone: 703-602-2439/ Fax: 703-602-2443

Mr. Jack Janetatos
President, Marine Machinery Association
733 15th Street, N. W.
Suite 700
Washington DC 20005
Phone: 202-452-7006/ Fax: 202-452-7074

GOVERNMENT INDUSTRY ADVISORY BOARD MEETING 5/4/95

Mr. Edmund C. Mortimer
Corporate VP, Manager of Shipyards Division, Avondale Industries, Inc.
P. O. Box 50280
New Orleans LA 70150-0280
Phone: 504-436-5100/ Fax: 504-436-5304

Mr. Dale Rome
Program Mgr., Carderock Division, Naval Surface Warfare Center
Code 2033
Building 192, Room 162
Bethesda MD 20084-5000
Phone: 301-227-1363/ Fax: 301-227-5753

Mr. Peter G. Schaedel
Vice President, Corporate Quality, Energy Transportation Company
1185 Avenue of the Americas
New York NY 10036
Phone: 212-642-9800/ Fax:

Dr. William S. Vorus
Professor, Naval Architecture and Marine Engineering, University of Michigan
North Campus
Ann Arbor MI 48109-2145
Phone: 313-764-8341/ Fax: 313-936-8820

Mr. Ken Wells
Vice President, American Waterways Operators, Inc.
601 Poydras Street
Suite 1621
New Orleans LA 70130
Phone: 504-524-3366/ Fax: 504-568-9023

Dr. E. Allen Womack Jr.
Sr. Vice President & Chief Technical Officer, McDermott International, Inc.
1450 Poydras Street
New Orleans LA 70112
Phone: 504-587-6178/ Fax: 504-587-4745

Prioritization List
Combined

ID		Score	1st Yr. Cost
Industry			
UNO 95-036	Benchmark the Worldwide Marine Machinery and Equipment Manufacturing Industry	480	$300,000
UNO 95-085	Development of a Portfolio of Ship Designs	469	$2,400,000
UNO 95-050	Automated Machine Learning of Diesel Engine Operating Characteristics	467	$249,000
UNO 95-077	An Investigation of the expansion of the GCRMTC ships' reliability, availability, and maintainability (RAM) database	467	$600,000
UNO 95-051	Off-Line Programming (OLP) is a Strategic Tool to Link the Design and Manufacturing Process	319	$85,000
	Total		**$3,634,000**
In-House			
UNO 95-002	Integrated Environmental Management Plan (EMP) for Shipbuilding Facilities	409	$171,560
	Total		**$171,560**
In-House Continuation			
UNO 95-026	Ships' Reliability, Availability, and Maintainability (RAM) Database (Continuation)	525	$553,260
UNO 95-023	Shipboard Sensors (Continuation)	520	$228,476
UNO 95-022	Software Applications for Shipbuilding Optimization (Continuation)	507	$140,340
UNO 95-027	Inexpensive Non-toxic Pigment Substitute for Chromium in Primer for Aluminum Substrate (Continuation)	407	$117,051
UNO 95-035	Applications of Integrated Optical Fiber Sensor Systems in Shipbuilding and Shipboard Monitoring (Continuation)	315	$285,035
	Total		**$1,324,162**
	Grand Total		**$5,129,722**

ENCLOSURE (1)

In-House Continuation

UNO #	Title	Score	Cost
UNO 95-019	An Accurate and Efficient Technique for Predicting Ship Roll Damping (Continuation)	215	$191,000
UNO 95-015	Performance Simulation of Marine Propulsion Systems Under Extreme Conditions(Continuation); Second Year: Towards Whole Drive Train Simulation	0	$224,000
UNO 95-016	The Development of Anti-Motion Sickness Techniques	0	$141,247
UNO 95-017	Improvement of the Technology Transfer Process within the Shipbuilding Industry (Continuation)	0	$120,000
UNO 95-018	Development of High Speed Marine Vehicle Design Database (Continuation)	0	$298,600
UNO 95-028	Ship Repair Computer Aided Drafting (CAD) Enhancement with Digital Photogrammetry (Continuation)	0	$390,224
		Total	$1,365,071

A-5

ENCLOSURE (2)

APPENDIX B

1995-96 ANNUAL PROGRAM PLAN

GULF COAST REGION MARITIME TECHNOLOGY CENTER

June 9, 1995

Cooperative Agreement No. N00014-94-2-001
Office of Naval Research/University of New Orleans

1994-95 ANNUAL WORK PLAN
GULF COAST REGION MARITIME TECHNOLOGY CENTER

I. BACKGROUND

Goal of Center

The primary goal of the Gulf Coast Region Maritime Technology Center is to help the U.S. Shipbuilding industry become more competitive on an international scale. The Center will foster competition in shipbuilding technology through cooperation with the U.S. Navy, representatives of the maritime industry and various academic and private research centers throughout the country.

The Center was established and funded through a cooperative agreement with the Office of Naval Research and the University of New Orleans (UNO).

Center Facilities

The Center is located at the University of New Orleans in the College of Engineering building. Operations will be conducted at two branch sites: New Orleans (co-located with the Center) and within the Lamar University System at the Orange, Texas campus. The Center and New Orleans site will move to the Center for Energy Resources Management (CERM) in the UNO Research and Technology Park sometime in 1997. The Lamar site is within a technology complex including the Center for Ship Hull Design. The UNO site's research focus will be on advanced structure design, environmental ship design, hydrodynamics of marine vehicles, vehicle maintenance and operation, and advanced materials and production processes. The Lamar site will focus on power transmission systems, ship hulls, electrical systems, and simulation-based design activities in support of the Navy and other DoD activities.

II. ACTIVITIES

The activities planned for the 1995-96 budget period are summarized in the following section of the work plan and include specific tasks and project areas.

A. Administration and Center Support Activities

The administrative staff coordinate support activities for the Center's projects and programs including accounting, purchasing, secretarial functions, preparation of budgets, quarterly and annual reports, brochures and newsletters. These activities will continue during the new budget period.

B. Outreach Activities and Research Activities

The Center will continue to provide support for selected research outreach and planning activities. Stage II Research Problem Statements describing each research activity, in-house or sub-contract, have been and will be reviewed by the Government/Industry Advisory Board (GIAB). On approval of the recommended Stage II Problem Statements by the Government Program Manager (GPM), RFP's will be issued. Subsequent proposals will be reviewed by the appropriate Site Director and submitted with recommendations and comments to the Center Director who will in turn review the proposals and submit them along with his recommendation to the GPM who will make the final decision regarding funding. The Center will then negotiate sub-contracts with the approved submitters.

1. Outreach Activities

The Center and Sites will conduct a number of education/training workshops during the year. This will include hosting and conducting workshops such as Agile Manufacturing, Simulation Based Design, Operation/Production/Project Management, Work Management/Workflow Emission Standards, Title XI Financing of Improvements of Facilities.

The Center has initiated the Shipbuilding Environmental Information Resource Center which will expand its existing environmental database to include environmental databases in various stages within the National Shipbuilding Research Panels (NSRP), identify mechanism for establishing effective industry government relationships, develop and initiate Center/Industry task force to address regulatory impact of the proposed OSHA Air Emission Standard.

The LU-O Site has initiated and developed the Simulation-Based Design Center. The Center will carry out research and applications related to the use of simulation in ship design. The facility and network have been designed to meet the needs and requirements of client users. The facility will be made available for use by a number of shipyards during the 1995-96 year.

2. Research Programs (New Orleans Site)

Enclosure 1 is a complete list of Research Problem II Statements approved by the GIAB at the May 4, 1995 meeting.. These include projects for sub-contracting with industry, a new in-house project and five continuation in-house projects. Additional continuation projects are shown on Enclosure 2. RFP's will be issued for the approved industry

Problem Statements, proposals will be evaluated and sub-contracts issued. (See tentative schedule on Enclosure 4.)

A complete listing of in-house ongoing projects along with their funding level is shown on Enclosure 3. Nearly all of these projects, assuming satisfactory progress, will be continued starting January 1, 1996.

3. Research Programs (LU-O)

The Orange Site will fund a number of NSRP S-4 and SP-8 Panel Projects during 1995-96. A tentative list of these projects is shown on Enclosure 5. The projects include a translation of the Japanese CIM's report for an NSRP SP-4 Panel Project. These project descriptions have already been developed and are ready for funding.

The LU-O Site also has two projects approved for initiation. These are "Short Turn Around Project Management"@ $135,000 and "Ship Repair Market Analysis" @ $132,000.

III. BUDGET

The Center's budget for the 1995-96 year includes funds provided under the ONR Cooperative Agreement. The funding includes funds for the GCRMTC and its two sites i.e. New Orleans and Orange. The funding levels based on FY 93 appropriation is firm whereas the funding levels for F 94 and FY 95 appropriations are estimates due to uncertainties in 1.) secondary Navy fees (SBIR) and 2.) uncertainties with regard to the amount appropriated for FY 95 for the GCRMTC.

The 1995-96 budget (best estimate) for the GCRMTC, including both the New Orleans Site and the Orange Site, is shown on Table 1.

NEW ORLEANS SITE PROJECT LISTING - 6/7/95:

#1: "Chromium Coatings"
Mr. Al Daech, Civil and Environmental Engineering
Initial Funding: $119,436/ Second Yr. Funding: $117,051
Addt. Researchers: Dr. Kenneth McManis

#10: "Development of High Speed Marine Vehicle Design Database"
Dr. Robert Latorre, Naval Architecture and Marine Engineering
Initial Funding: $495,853/ Second Yr. Funding: $298,600
Addt. Researchers: Dr. Paul Herrington

#14: "Integrated Optical Fiber Sensor Systems"
Dr. Shing Lee, Electrical Engineering
Initial Funding: $192,038/ Second Yr. Funding: $285,035
Addt. Researchers: Dr. Rasheed Azzam

#15: "PM Motor Drives"
Dr. Pragasen Pillay, Electrical Engineering
Initial Funding: $77,002/ Second Yr. Funding: $0

#16: "Shipboard Sensors"
Dr. Russell Trahan, Electrical Engineering
Initial Funding: $256,281/ Second Yr. Funding: $228,476
Addt. Researchers: Dr. Robert Lipp, Dr. Paul Chirlian

#18: "Integrated RAM Database"
Dr. Bahadir Inozu, Naval Architecture and Marine Engineering
Initial Funding: $200,583/ Second Yr. Funding: $553,260

#20: "Performance Simulation of Marine Propulsion Systems"
Dr. Bahadir Inozu, Naval Architecture and Marine Engineering
Initial Funding: $180,841/ Second Yr. Funding: $224,000

#23: "Structural Design Procedures"
Dr. Michael Folse, Civil and Environmental Engineering
Initial Funding: $$90,746/ Second Yr. Funding: $0
Addt. Researchers: Dr. Norma Jean Mattei

#27: "Concurrent Engineering Processes in Shipbuilding"
Dr. Norman Whitley, Mechanical Engineering
Initial Funding: $185,389/ Second Yr. Funding: $140,340
Addt. Researchers: Dr. Stephen C. Lipp

#30: "Technology Transfer"
Mr. William Lannes, Associate Dean, College of Engineering
Initial Funding: $127,569/ Second Yr. Funding: $120,000
Addt. Researchers: Dr. James Logan

#35: "Digital Image Photogrammetry"
Mr. Cliff Mungier, Civil and Environmental Engineering
Initial Funding: $339,156/ Second Yr. Funding: $390,224

#36: "Predicting Ship Roll Damping"
Dr. Jeffrey Falzarano, Naval Architecture and Marine Engineering
Initial Funding: $222,296/ Second Yr. Funding: $191,000
Addt. Researchers: Dr. Korpus

#99: "Relationship between Motion Sickness and Personality"
Dr. James May, Psychology
Initial Funding: $100,000/ Second Yr. Funding: $141,247
Addt. Researchers: Dr. Thomas Dobie

ENCLOSURE (3)

TENTATIVE SCHEDULE

REQUEST FOR PROPOSALS (RFP's)

Issue Presolicitation Notices	30 June 95
Issue RFP packages	14 July 95
Receive Project Proposals	15 August 95
Review Project Proposals/Solicit Revisions if required	15 August - 8 September 95
Submission of Project Proposals to Government Program Manager (GPM)	15 September 95
GPM Decision	22 September 95
GCRMTC Issues Subcontracts	29 September 95

Enclosure (4)

RESEARCH PROGRAMS (LU-O)

Of the projects reviewed, the following appeared to have a close fit with the goals and objectives of the GCRMTC-LUO:

Project No.	Project Title	Estimated Cost
SP4 FY 96 proj	Production Process Simulation for Design	$ 134,000
SP4 FY 96 proj	Parametric and Modular Ship Design Development	$ 345,500
SP4 FY 96 proj	Definition and Design of Outfitting Units for Commercial Vessels	$ 274,000
SP4 FY 96 proj	Product Model Based Planning and Scheduling	$ 164,000
N9-95-3	Development of Two Interactive Multimedia Training Modules	
SP4 FY 96 proj	Development of STEP Ship Product Model Data Set	$ 1,400,000
	Total Estimated Cost	$ 2,317,500

With the exception of Project No. N9-95-3, the topics, of research in the above list of projects are clearly related to the types of work to be undertaken under the SBD Center. The NSRP and the GCRMTC-LUO will collaborate in the development of proposals to meet the goals of these projects.

The proposals developed for these projects include to the extent practical (based on cost, benefit, and availability) the resources of the GCRMTC-LUO and the SBD Center. The proposals must define partnerships with the GCRMTC-LUO in which components of work are done by the Orange Site, by including access to the equipment and facilities at the GCRMTC-LUO.

Enclosure (5)

		Fiscal Year 1996			
		Center and UNO/Lamar Sites			
Funding Appropriations		**QI - FY 96**	**QII - FY 96**	**QIII - FY 96**	**QIV - FY 96**
And Increments		**Oct - Dec 95**	**Jan - Mar 96**	**Apr - Jun 96**	**Jul - Sep 96**
	Totals				
Beginning Balance From FY95		$4,541,500			
FY 95 Appropriation Estimate	*$4,500,000*	$4,500,000			
Internal Expenditures	***Totals***				
Center/New Orleans Site		$304,080	$366,420	$294,080	$351,420
Lamar Site		$513,973	$422,155	$415,531	$414,790
Sub-Total	*$3,082,449*	$818,053	$788,575	$709,611	$766,210
In-House Projects	***Totals***				
New Orleans Site	*$1,699,685*	$577,350	$400,000	$400,000	$322,335
Lamar Site	*$1,279,840*	$298,347	$430,454	$347,648	$203,391
Sub-Total	*$2,979,525*	$875,697	$830,454	$747,648	$525,726
Subcontracted Projects	***Totals***				
New Orleans Site	*$1,699,685*	$849,842	$25,000	$824,843	
Lamar Site	*$1,279,840*	$1,279,840			
Sub-Total	*$2,979,525*	$2,129,682	$25,000	$824,843	$0
Totals		$3,823,432	$1,644,029	$2,282,102	$1,291,936
Funding Balance		$5,218,068	$3,574,039	$1,291,937	$0
Industry	***Totals***				
Collaboration Revenues New Orleans	*$800,000*	$200,000	$200,000	$200,000	$200,000
Collaboration Revenues Lamar	*$140,000*	$30,000	$30,000	$30,000	$50,000
Expenditures New Orleans	*$800,000*	$200,000	$200,000	$200,000	$200,000
Expenditures Lamar	*$140,000*	$30,000	$30,000	$30,000	$50,000
Revised 6/9/95					

TABLE 1

APPENDIX C

INEXPENSIVE NON-TOXIC PIGMENT SUBSTITUTE FOR CHROMIUM IN PRIMER FOR ALUMINUM SUBSTRATE

GCRMTC PROJECT NO. AMTC95-001B

Principal Investigator: **Alfred F. Daech**
Department of Civil and Environmental Engineering

Additional Researcher: **Kenneth L. McManis**
Department of Civil and Environmental Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: Preliminary tests demonstrate that Aluminum-Lithium pigment in an acrylic vehicle does inhibit corrosion of aluminum substrates in salt spray and humidity tests. The objectives of this project are to up-grade the lithium pigment, optimize the pigment and formulate an essentially non-toxic paint using recent innovations.

One objective of this project is to identify or create new corrosion inhibitors based on aluminum-lithium to a degree where they will represent a satisfactory substitute for the chromium now used in paints for aluminum. The second objective will be to incorporate this pigment into a paint vehicle which can be used as a primer and which is essentially non-polluting. Finally, the objective will be to accommodate the products to Navy requirements for various paint specifications where possible and to arrange a manufacturing facility.

The scope of this project as described is very broad. Obviously one cannot develop a new concept in coatings and follow through to a broad set of specifications and uses in one or two years for a few hundred thousand dollars. However, we will demonstrate that the product can fulfill all of the requirements from the pigment concept to the final use. The pigment will be investigated in detail. The coating will utilize existing vehicles i.e. latexes, etc. used by the Navy under military specifications with chromate pigments. An assessment the suitability of the developed product to meet existing specifications and propose modifications, inserts, or deletions.

The American Conference of Governmental Industrial Hygienists in their 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices does not list lithium compounds as a particular problem although the subject has been studied in connection with batteries, ceramics and as an absorber of atomic particles in nuclear reactors. Only Lithium Hydride is listed on the Threshold Limit Values (LTV) list prescribed by the American Conference of Governmental Industrial Hygienists.

Generally, the lithium compounds are not considered toxic, depending on the anion. Lithium Hydride, Lithium Hydroxide, Lithium Fluoride, Chloride and Lithium Selenate, to name a few are toxic, largely due to the toxicity of the anions. Lithium is a common element and many of the salts, acetate, benzoate, borate, carbonate, lactate, nitrate and sulfate are commercially available and regarded as non-toxic. The overall toxicity will be determined when the final formula is selected. The paint vehicles will be selected from those which are environmentally acceptable.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$119,436
FUNDS REMAINING:	$ 78,225

ACCOMPLISHMENTS THIS PERIOD:

The enclosed schedule has slipped in some task areas due to the flood in the city of New Orleans the first week of May, delaying the factory representative's arrival to verify the problem with the defective research equipment purchased earlier. The defective test equipment has been shipped back to the manufacturer and new equipment has been received.

Contact Suppliers by Phone

Doctor Alex Chou of Reynolds has agreed to send us the version of Aluminum-Lithium proposed for use on the Space Shuttle. Comalco (Australia) has agreed to supply a sample of high lithium content alloy. Alcoa has offered to sell sheets of alloy 2090, but the price and quantity is excessive.

The Aluminum Powder Company Limited in England unofficially suggested a price of $8/lb in large quantity, but for 150 lbs. minimum the price is about $40/lb. Negotiations are underway to get smaller quantities at a better price. International Nickel, Pichonet, Kaiser, Alcan and International Light Metals have not yet agreed to participate.

Survey of Similar Studies

The only study found in references was that conducted by R.G. Buchheit of Sandia and Jing Gui and M.T. Douine (University of California, Berkley). It appears that they are working on the "Anodize" or "Irridite" approach. Buchheit is sending his papers to us and this will complete our file of the published work to date by the University of California. This task is essentially complete.

Literature Review

All but two or three of the sixty pertinent papers from the literature survey are on file and have been studied. This will be periodically updated but is essentially complete. (See Lithium Salts below)

PROPOSED ACTIVITIES NEXT PERIOD:

Order Any Other Promising Inhibitors
Some chemical inhibitors are on hand, others will be ordered as the need develops.

Prepare Screening Tests
The first screening tests will be performed on pure aluminum panels. We will look at passivation by combinations of inhibitors. 5,000 and 2,000 series alloys will then be checked to look at alloying effects on the aluminum corrosion properties as related to the passivity produced by the lithium and its salts.

Perform Rating by Electrochemistry
This task was delayed due to equipment malfunction. It is now repaired and results will be reported in the next quarter.

Treat Pigments
Pigments cannot be treated until the equipment is functional so that results can be checked. This also will be reported in the next quarter.

Analyze Lithium Salts & Metals
A study was made and the promising materials are on hand. Corrosion inhibitors were selected and obtained such as: Lithium Carbonate; Lithium Nitrate; Lithium Acetate; Lithium Citrate; Lithium Molybdate; Lithium Chromate; Lithium Titamate; Lithium Phosphate; Lithium Hydroxide

General Meeting with Coast Guard in Grand Isle
A meeting was held with Wm. R. Ingram, 1st. Class Boatswain Mate and C.O. Mr. Hatton at Grand Isle Coast Guard Station (address P.O. Box 158, Grand Isle, LA 70358 - Phone 504-787-2135).

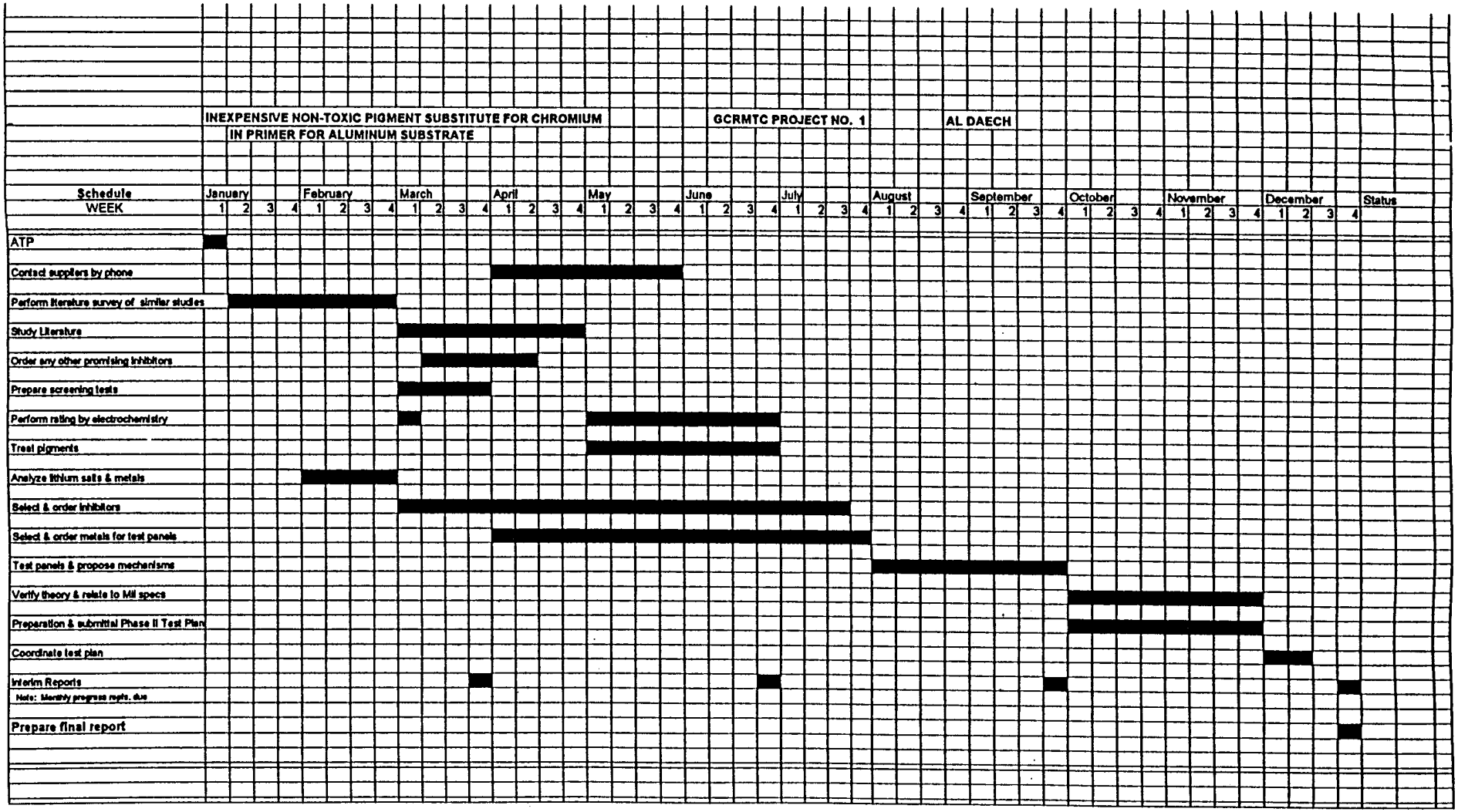
The nature of the meeting was to discuss the fact that all of the Coast Guard's boats and ships at Grand Isle are having corrosion problems to varying degrees. They apparently have very serious problems.

The largest ship (80 foot) has corrosion as do most of the smaller crafts. Larger ships at other stations have steel hulls and aluminum superstructures. The Coast Guard no longer is permitted to use chromium and are presently using an organic corrosion inhibitor which isn't worth a "darn" (paraphrased).

In any event, the Coast Guard is anxious to have an improved primer and they indicated a willingness to cooperate with us in our project and research.

Collaboration Efforts with EuroNavy and NAVSEA

Discussion will continue with representatives of EuroNavy and NAVSEA regarding testing procedures to be followed when pigments are available.


INEXPENSIVE NON-TOXIC PIGMENT SUBSTITUTE FOR CHROMIUM
IN PRIMER FOR ALUMINUM SUBSTRATE
GCRMTC PROJECT NO. 1
AL DAECH
Schedule
WEEK
January
February
March
April
May
June
July
August
September
October
November
December
Status
ATP
Contact suppliers by phone
Perform literature survey of similar studies
Study Literature
Order any other promising inhibitors
Prepare screening tests
Perform rating by electrochemistry
Treat pigments
Analyze lithium salts & metals
Select & order inhibitors
Select & order metals for test panels
Test panels & propose mechanisms
Verify theory & relate to Mil specs
Preparation & submittal Phase II Test Plan
Coordinate test plan
Interim Reports
Note: Monthly progress rpts. due
Prepare final report

APPENDIX D

INTEGRATED ENVIRONMENTAL MANAGEMENT PLAN FOR SHIPBUILDING FACILITIES

GCRMTC PROJECT NO. AMTC95-008A

Principal Investigator: **Bhaskar Kura**
Department of Civil and Environmental Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: The project is aimed at developing an integrated environmental management plan for shipbuilding facilities that includes source reduction (waste minimization at the source), recycling, treatment and disposal. To achieve the research objectives, Avondale Shipyard will be closely studied with data collection from other sources on activities that are not common to Avondale. The project duration is three years with completion reports at the end of each year. The final product will contain two reports, a specific Environmental Management Plan (EMP) report to serve Avondale and a generic EMP report to serve the shipbuilding industry in general.

The main components of the study are process review, identification of sources of pollution, quantification of pollutants (in solid, water and air streams), impact evaluation, review recycling/ treatment alternatives, study disposal alternatives and regulatory compliance. The first year activities include a study of sources of pollution, emission quantification and some progress on characterization of waste streams and a review of current pollution management practices.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$ 159,380
FUNDS REMAINING:	$ 159,380

ACCOMPLISHMENTS THIS PERIOD:

This project received its funding approval in the beginning of June 1995. The progress achieved during the last few weeks is as follows:

1. Reviewed potential graduate assistant applications to work on the project. About eight to ten new full-time graduate students expected in Civil & Environmental Engineering for Fall 1995. Two of them have expressed an interest in Environmental Engineering Specialty. Appointments will be finalized after personal interviews in August 1995. One student worker has been selected for the project and will soon be appointed.

2. Met with Avondale Environmental Manager to plan the first field visit to the Avondale Shipyard toward the beginning of July 1995.

3. Literature review extended to further identify and prioritize the various sources of pollution in shipyards.

4. A copy of the report on "Evaluation of Toxic Air Emissions" was received from NASSCO. The report is being reviewed for possible use in this project.

PROPOSED ACTIVITIES NEXT PERIOD:

1. Conduct two to four field visits to Avondale shipyard to get a preliminary understanding of the shipyard and to become familiar with various environmental/process personnel. These field visits are expected to provide an excellent orientation for the graduate students/student workers and the P.I.

2. Identify the literature related to the project and procure the necessary technical documents. The documents of interest include:

EPA's Emission Factors Publication
EPA and the State Regulatory Publications
Other Environmental Projects Completed or Being Completed

3. Prepare flow charts for various processes within the shipyard that identify the material flow, sources of pollution / waste generation.

4. Review the priority pollutants in air, water and solid waste streams in consultation with Avondale and DEQ personnel.

5. Collect the existing data on discharge of pollutants. Identify the need for additional monitoring if the data is missing for important pollutants of concern.

6. Identify the air quality monitoring equipment required for any specific application. Review technical specifications of different manufacturers and purchase the essential equipment.

GCRMTC PROJECT NO. 8 **YOUR NAME: Bhaskar Kura**

Integrated Environmental Management Plan for Shipbuilding Facilities

Schedule	January				February				March				April				May				June				July				August				September				October				November				December				Status	
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	Start	Finish
1995																																																	
1. Literature Review																																																6/95	8/95
2. Identification of Waste Streams thr. Field Visits																																															7/95	11/95
3. Quantification of Wastes (Solid, Liquid and Air)																																															9/95	5/96
4. Characterization of Wastes																																															10/95	11/96
5. Review Current Waste Management Practices																																															7/95	11/96
1996																																																
3. Quantification of Wastes (Solid, Liquid and Air)																																															9/95	5/96
4. Characterization of Wastes																																															10/95	11/96
5. Review Current Waste Management Practices																																															7/95	11/96

Note: Tasks 4 and 5 extend beyond 12 month period and spread into the year 2 program.

APPENDIX E

DEVELOPMENT OF HIGH SPEED MARINE VEHICLE DESIGN DATABASE

GCRMTC PROJECT NO. AMTC95-010A

Principal Investigator: **Robert Latorre**
Department of Naval Architecture and Marine Engineering

Additional Researcher: **Paul Herrington**
Department of Mechanical Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: This project addresses the lack of necessary data for selecting an efficient and economically priced high speed marine craft. The project emphasizes the development of required design standards and database methodology for systematic studies focused on the design of efficient and economically priced high speed marine transport craft. Presently these craft are being developed in Northern Europe and the Pacific Rim countries. With the weakening of the US dollar, there is a developing market niche for US shipyards to competitively market these craft worldwide. The project also includes design and procurement of unique ship structures testing equipment required to test designs based on advanced lightweight materials.

Project Notes:

a) Focus

This Project is primarily focused on high speed aluminum-steel catamaran designs with possible extension to composite materials.

b) Data Base Integration

As part of the database development we looked at the possible integration of our Project 10 database with Project 18 RAM database. Unfortunately the two databases do not appear to be effectively combined for the following reasons:

1 - User differences. The RAM is directed towards Marine Operations. The High Speed database is directed to Marine Design.

2 - Differences in database organization. The RAM is based on components i.e. pumps, valves, etc. while the High Speed database is focused on ship design, i.e. length, tonnage, speed.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$495,853	(Year 1)
FUNDS REMAINING:	$392,000	(Year 1)

ACCOMPLISHMENTS THIS PERIOD:

Task I - Survey of state of the art completed. This includes:

1 Completion of high speed marine vehicle data base program organization.
2 Entries of 450 recreational (22-75 ft.) and 100 larger high speed commercial catamaran vessels into database.
3 One technical paper presented at 3/30/95 SNAME meeting
4 Technical report / Summary Paper Schedule for 9/95 SNAME Gulf Coast

Task II - Domestic/Overseas shipyard visits:

II.1 US shipyards visited by Dr. Latorre:

1 Swiftships, Morgan City, LA, 05/16/95. Discussion of Structural test program

2 Bath Iron Works, Bath Maine, 06/7/95. Discussion of UNO database for large speed catamaran design

3 Trinity Marine, Gulfport, MS, 05/16/95. Discussion of UNO database for catamaran design

II.2 Australian Shipyards (Ref. 5/95 Trip Report)

1 Met with Australian Export Association in Perth, 4/11/95

2 Austral Shipyards, Henderson West Australia, 4/11-12/95
Tour of 78 m passenger catamaran - Discussion of design rules, hull structure

3 Transfield Shipbuilding, South Cogee, West Australia, 4/12/95 - Discussion of 78-80 m catamaran market and design

4 Wavemaster International, Henderson West Australia, 4/13/95. Tour of 40 m catamaran. Discussion of design rules for hull structure.

5 NQEA. Australia Pty Ltd, Cairns, Australia, 4/18/95. Tour of 38 m Incat, discussion of design rules and structural testing.

II.3 Ship Structural Laboratories visited by Dr. Latorre, Dr. Herrington:

1 David Taylor Naval R D Center Laboratory, 1/15/95
Discussion of Ship Structure testing

2 Lehigh University Allenton PA, ATLSS Laboratory, May 19,1995
Discussion of ship/steel structure testing

Task III - Fast Catamaran design rules:

1 Acquisition of High Speed Design Rules set.
   a. DNV Rules (Norwegian) for "High Speed Light Craft", 1995
   b. BV,GL, and RIN (French, Germany, Italian) for High Speed Craft 1995
   c. Solas rules for passenger craft

2 Development of software program CATLOADI for calculation of loads on catamaran hull for structural design

3 Development of design rules for estimating the low resistance geometry of catamaran hulls to be validated by tow tank tests.

4 Discussion of lightweight catamaran structure with Mr. Lind, American Bureau of Shipping ABS.

Task IV - Development of Computer Integrated Manufacture Approach

1 Participation by shipyard design/engineering group in the design/analysis of catamaran structure begun 6/95.

Task V - Preliminary Hydrodynamic / Structure validation testing.

1 Tow tank test
   a. Test models C1/C2 catamaran with variable hull separation are in the design phase.
2 Structure Testing
   a. Participation of shipyard design/engineering group in the design of the catamaran deck/side piece for structural testing.
   b. Loan of large capacity hydraulic jack system for destructive testing.
   c. Revision of initial Bid specs.
   d. Purchase order of structure analysis system (computer and FEM test support software)

PROPOSED ACTIVITIES NEXT PERIOD:

Task I - Summary of State of Art.

a. Presentation of Summary Paper at September/95 Gulf Section of SNAME Meeting
b. Presentation of Summary Paper at RINA Meeting
c. Submission of Journal Paper to SNAME

Task II - Completed / No Action Envisioned

Task III -

a. Use software CATLOADI for design study in conjunction with the structural test program

b. Completed; Awaiting review of two MARITEC proposals submitted in Feb. 95.

Task IV -

a. Awaiting review of MARITEC proposal covering the build strategy for the development of high speed marine vehicle.

Task V

I - Tow Tank Test

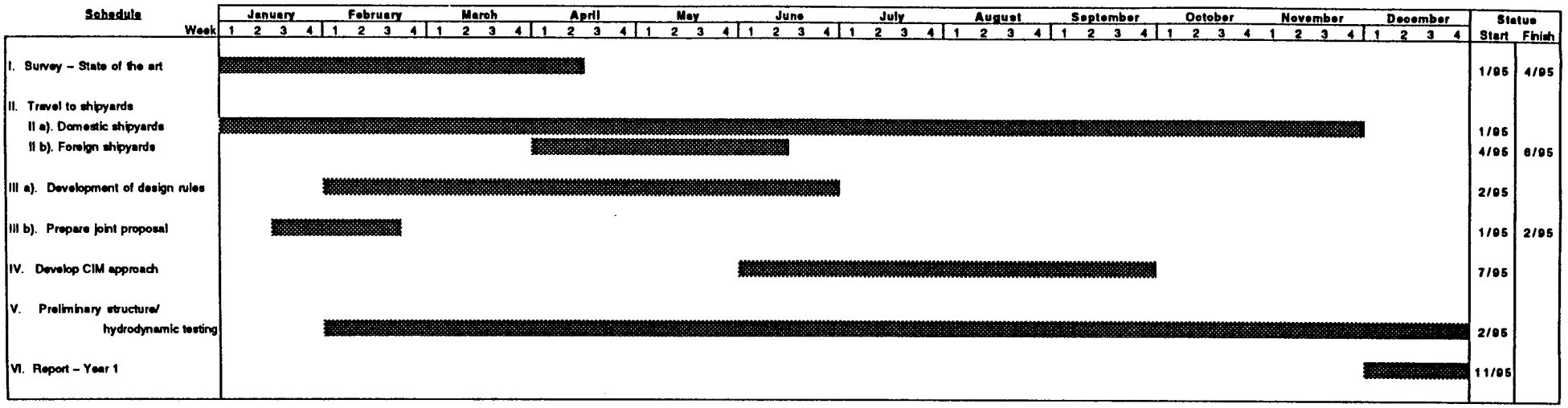
a. Manufacture tow tank models C1 and C2 for evaluation and validation of High Speed design rule on catamaran separation distance.

II - Structural Test

a. Completion of BID awarded and installation of equipment

b. Set up structural test for validation of design rules

Development of High Speed Marine Vehicle Design Database



APPENDIX F

APPLICATIONS OF INTEGRATED OPTICAL FIBER SENSOR SYSTEMS IN SHIPBUILDING AND SHIPBOARD MONITORING

GCRMTC PROJECT NO. AMTC95-014A

Principal Investigator: **Shing Lee**
Department of Electrical Engineering

Additional Researcher: **Rasheed M. A. Azzam**
Department of Electrical Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: The project proposes a novel fiber-optic-sensor system based on in-line photopolarimetric measurements using D-shape fibers to address the performance and cost issues. The system is compact, sensitive, and can be multiplexed throughout the ship to provide hazard warning, pollution monitoring, processing monitoring, etc. With the use of the D-shape fiber, the sensor head is integrated to improve the compactness and reliability. This work is to investigate the applicability of shipboard monitoring using such a fiber optic system.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$192,039
FUNDS REMAINING:	$107,864

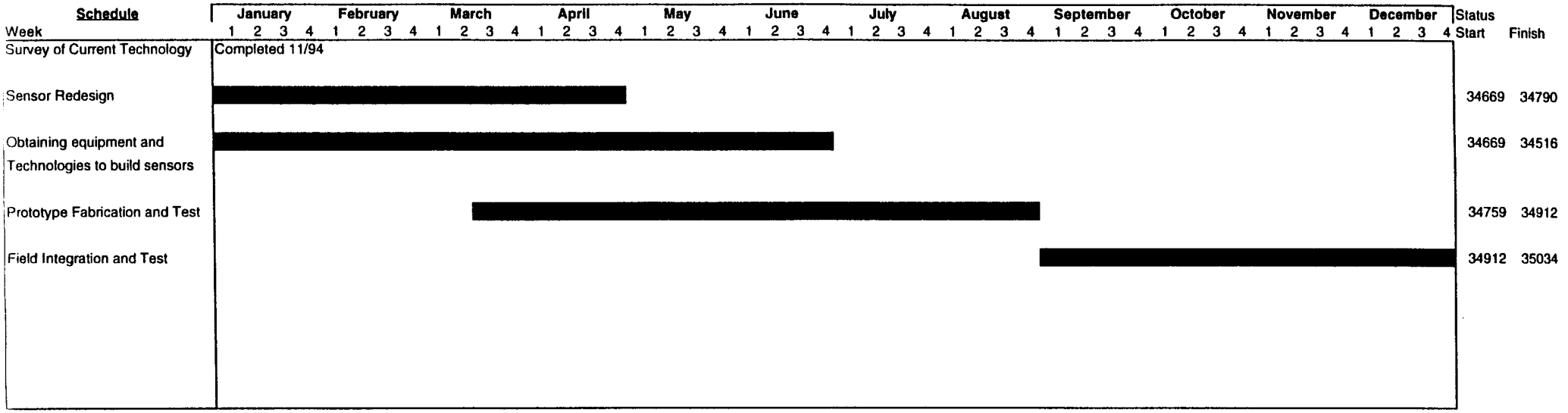
ACCOMPLISHMENTS THIS PERIOD:

1. Most of the equipment has arrived. The laboratory is being set up to build the prototype sensors. However, a delay was experienced on the HP polarization analyzer due to contractor problems. It has just arrived.
2. The effects of fiber twisting on the state of polarization are under thorough investigations. A mathematical model to describe the twisting effects has been located, now that the Polarization Analyzer has arrived, the results will be verified.
3. Evanescent absorption sensors using D-shape fibers are under investigation. The effects of the core to flat surface on evanescent coupling in the D-shape fibers are studied experimentally and theoretically. The various distances are obtained using HF etching.
4. Polarization-preserving fiber-optic directional couplers have many potential applications in fiber optic sensors such as temperature and pressure sensors. Such directional couplers are under investigation and the results will be presented in the Lightwave Electro-Optic Society (LEOS) meeting this fall.
5. Discussions on the progress and future directions of both of our projects have been held with Dr. Trahan. Ideas and recent development information will be shared.
6. A number of fiber optics manufacturers such as 3M, Oz Optics, Wave Optics, and United Technologies have been invited to join us in developing shipborne fiber optic sensors.

PROPOSED ACTIVITIES NEXT PERIOD:

1. In the course of studying the twisting effects, it was discovered that the polarization rotation can be controlled precisely in a fiber that can be rotated through twisting. This phenomenon is very suitable for polarimeter applications using planar technologies. Polarimeters will be made by applying a permanent twist to an elliptical core fiber and gluing it onto a silicon V-groove. The fiber light in the core can be accessed through polishing of the fiber.
2. A spatial frequency and wavelength division multiplexer will be studied for shipboard fiber sensor networks.
3. The fiber sensor heads and detection units will be made simultaneously. They can be tested using the polarization analyzer.
4. Contact with McDermott for collaboration and a possible partnership will be initiated.

Shipboard Sensors



APPENDIX G

RESEARCH IN SHIPBOARD SENSORS

GCRMTC PROJECT NO. AMTC95-016A

Principal Investigator: **Russell Trahan**
Department of Electrical Engineering

Additional Researcher: **Robert Lipp**
Department of Mechanical Engineering
Additional Researcher: **Paul Chirlian**
Department of Electrical Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: The project involves developing fiber optic sensors for the commercial shipbuilding industry through use of existing technology. The main thrust of the first phase of this project is *Task 1: Survey of current technology*. This survey consists of a reexamination of the present US Navy requirements for sensors aboard ships and also a survey of commercial vessel requirements. This task is nearly completed. *Task 2: Sensor redesign* has been initiated along with *Task 3: Design of data acquisition system.*

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$256,281
FUNDS REMAINING:	$131,168

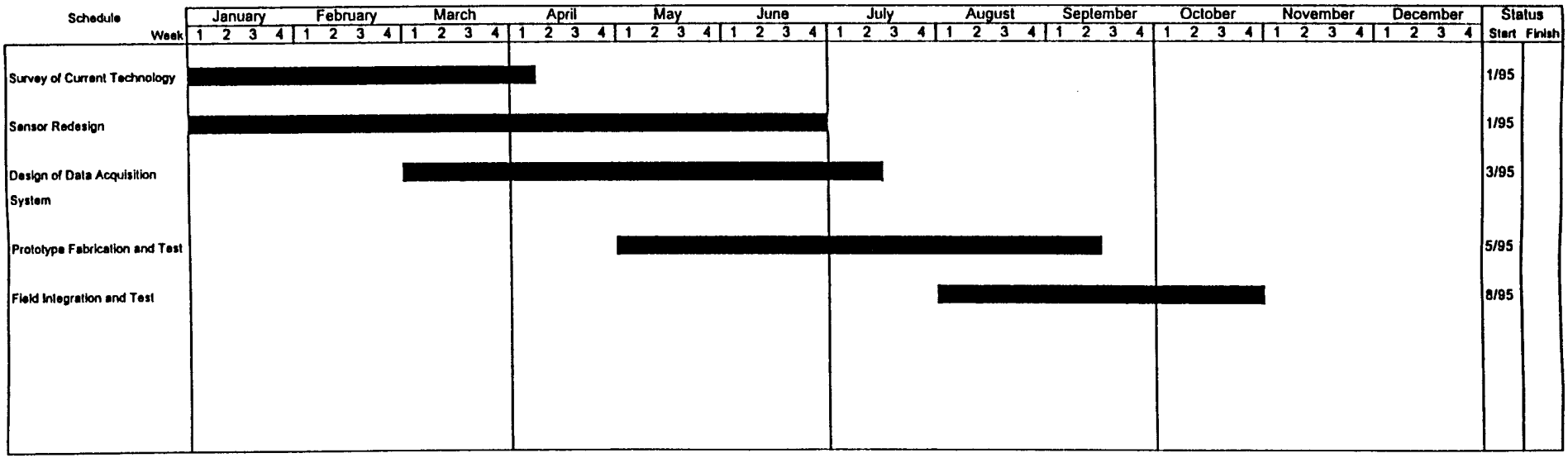
ACCOMPLISHMENTS THIS PERIOD:

1. Virtual completion of shipboard commercial sensor distribution statistics - presently awaiting one more response from system supplier.
2. Procured A/D-D/A hardware.
3. Prepared basic specification and identified sources for the environmental chamber needed for temperature sensor verification and testing.
4. Demonstrated satisfactory optical power conversion for optical smoke detector operation. Optical prototype for collection and distribution of optical power successfully demonstrated.
5. Developed specifications for high power laser driver for conversion testing.
6. Basic optical sensor transmitter and receiver circuit design completed and have identified low power approach for modifying circuits to incorporate sensor addressing scheme.
7. Initiated review of temperature sensors and have identified possible single approach for both rate and absolute measurements.
8. Discussed techniques being pursued by Dr. Shing Lee for GCRMTC Project No. 14 for fiber optics measurements. His techniques involve polarimetry while ours (Project No. 16) are amplitude based only. We will investigate the possibility of combining the two approaches for the temperature sensor.
9. Initiated review of liquid level point sensor and engaged in conversations with potential fabricator.
10. Defined data collection concepts and preliminary algorithms.

PROPOSED ACTIVITIES NEXT PERIOD:

1. Develop testing plans for the sensors.
2. Complete smoke detector prototype and initiate smoke chamber testing.
3. Complete optical power conversion testing for optical smoke system.
4. Complete design and fabrication of temperature sensor prototype.
5. Procure environmental chamber and prepare for temperature testing.
6. Finalize liquid level point sensor discussions and refinements.
7. Complete software for sensor data collection and processing.

Shipboard Sensors



Updated June 16, 1995

APPENDIX H

SHIPS' RELIABILITY, AVAILABILITY, AND MAINTAINABILITY (RAM) DATABASE

GCRMTC PROJECT NO. AMTC95-018A

Principal Investigator: **Bahadir Inozu**
Department of Naval Architecture and Marine Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: To establish an integrated RAM database to collect, process, analyze and disseminate field data from merchant ships for new failures, to download existing ship machinery failure history data from ship logs, to access international RAM databases, to investigate reliability and maintainability of existing shipboard components, and to provide a basis for optimizing maintenance and ship building practices, increasing the reliability, safety and quality of U.S. ship operations and recommending new ship designs.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$210,583
FUNDS REMAINING:	$179,869

ACCOMPLISHMENTS THIS PERIOD:

Data Collection, Processing, Dissemination Software Development

Reliability, Availability and Maintainability Data Entry program (DATE) Beta Version 1.05 and Ship Performance Review Program SHIPPER Beta Version 1.03 have been completed and tested at GCRMTC, ETC, Sea-Land, ARCO Marine and PRC for three months. Private meetings were held with ARCO, ETC and Sea-Land managers regarding their evaluation and company specific interfaces. Based on the evaluations, various modifications/upgrades have been identified and approved by the SOCP executive committee. These modifications include the following:

1. Extensions to voyage information to cover voyage legs, anchor events, and dry-dock events
2. Removal of repair action dependence on voyages (repairs can extend across multiple voyages)
3. Ability to modify equipment operation rates under steaming and anchor/port conditions without losing previous rates. Modifications to include a marker to indicate whether or not the equipment operates in dry-dock
4. Addition of equipment class categories
5. Addition of initial operating hours for equipment
6. Temporary corrective repairs will be tracked as a folder until such time as the repair becomes permanent
7. Ability to enter all parts and costs used in the repair

8. A printout of a vessel timeline from any starting point to any ending point.
9. Ability for the chief engineer to override cumulative operating hours and use this value for future computations.

DATE & SHIPPER upgrades were approved for development by GCRMTC. Specifications of Ship Performance Indicator Program (SPIN) have been developed. Pilot nameplate transfers of ARCO, ETC and Sea-Land were completed. The number of Name Plate Data Fields to be traced for cross referencing and matching were increased.

SNAME CyberNautics'95 Conference

Dr. Inozu attended SNAME's CyberNautics'95 conference on April 20-22, 1995 at Long Beach, CA and presented the paper entitled "Networking to Improve Ship reliability, Availability, and Maintainability" with Mr. Peter Schaedel, ETC (SOCP executive committee member and supervisor of the RAM Database project), who is also the co-author of this paper. At this conference, GCRMTC shared a booth with SOCP. This booth was manned by SOCP executive committee members, Mr. Schaedel from ETC, Mr. Frank Lee from ARCO Marine, and Mr. James J. McCabe III from BP Oil, and Dr. Inozu from GCRMTC. At this booth, demonstration videos of DATE and SHIPPER were shown and live demonstrations of DATE program were presented. GCRMTC brochures were also disseminated at this conference.

ICMES TC-1 Meeting

Dr. Inozu attended ICMES TC-1 (International Cooperation on Marine Engineering Technical Committee on Availability, Reliability, Maintainability and Safety) meeting on May 12, 1995 at ISDEFE in Madrid, Spain. Other participants of this meeting were Nils Dellgren from Sweden, Prof. Magnus Rasmussen from Norway, Prof. Amable Lopez Pineiro and Arberto Sols from Spain, Mr. G. Jones from England, Dr. Hans Jakop Gatjens from Germany. Representatives from the Spanish Maritime Industry joined the afternoon session of this meeting.

Dr. Inozu made a presentation about the Reliability Database Project and GCRMTC. The present status of international networking initiative was also discussed. Various alternatives to speed up the establishment of this network were addressed in addition to the development of ISO (International Standards Organization) Data Exchange Standards (STEP) and its Application Protocol (AP) : 226 - Ship Mechanical Systems. AP 226 is led by Lloyd's Register and covers reliability, availability, maintainability and life cycle standards. Prof. Rasmussen made a presentation about the current status of the MARITIM -IT program.

Dr. Gatjens talked about the Ships Safety Systems (3S) proposal. Dr. Inozu also had separate private meetings with Prof. Rasmussen and Nils Dellgren regarding our networking for ship reliability information exchange.

Dr. Inozu met with Dr. John Kendall, the director of ShipSTEP project regarding STEP Application Protocol 226: Ship Mechanical Systems in London On May 18, 1995. SOCP's involvement for the development of AP 226 will be coordinated by Mr. John Dumbleton of U.S. Maritime Administration. On May 19, 1995, Dr. Inozu also had a meeting with Mr. Jones, Head of Lloyd's Safety Department at Lloyd's Croydon Headquarters regarding the specifics data analysis and AP 226.

Ship Safety - MSTEP & RAM Database Interface

Dr. Inozu attended the Formal Safety Assessment Seminar at International Maritime Organization (IMO) Headquarters on May 18, 1995 in London. Dr. Inozu also met with Mr. Zbigniew J. Karaszewski, MSTEP Program Manager who made a presentation about MSTEP at IMO. The current status of MSTEP project and interfacing MSTEP with our RAM Database were discussed. At the request of Mr. Karaszewski, Dr. Inozu attended the Preliminary Hazard Analysis (PrHA) Meeting of MSTEP at Topsfield, MA on June 5-8, 1995. We are currently developing an interface plan between our RAM Database project and MSTEP.

We started providing qualitative and quantitative reliability and failure data /reports to MSTEP core team via Mr. G. Miante who is both the USCG representative at SOCP executive committee and a member of MSTEP core team. MSTEP team is also working very closely with the Navy's ERAM (Engine Room Arrangement Modeling) Project team. Mr. Kevin Lynaugh, ERAM Project Director, also attended this meeting and Dr. Inozu briefed Mr. Lynaugh about our RAM Database project. In cooperation with Mr. Karaszewski, we are currently developing the MSTEP - GCRMTC/SOCP RAM Database interface plan.

ABS Rules 2000

Dr. Inozu attended a special ABS Rules 2000 meeting at ABS Europe headquarters and made another presentation about the database project at this meeting on May 19, 1995 at the request of Mr. Edward T. Reilly, Director of New Business Development at ABS New York and Mr. M. Mahmoud, Manager of Technology development at ABS Europe. DATE and SHIPPER (our data collection and data processing programs) demo videos were also shown at this meeting. ABS managers from various offices around the globe attended this meeting. They would like to utilize the RAM database to revise their machinery rules as part of Phase II of the revisions. We will be developing a plan about the use of RAM database for the revisions including STEP application protocols and special ABS incentives to attract more ship operators to populate the RAM database.

IMAS 95 Conference

On May 24-25, 1995, Dr. Inozu attended IMAS' 95 (Ninth International Maritime and Shipping Conference) - Management and Operation of Ships: Practical Techniques for Today and Tomorrow. At this conference, a brochure about our RAM database and International Networking Initiative was also distributed.

SOCP Executive Committee Meeting

Dr. Inozu attended the annual meeting of SOCP Executive committee on June 1-2, 1995 at Silver Spring, MD. Dr. Inozu made a presentation about the progress report for the SOCP sponsored Phase II of the Ships' RAM Database Project. GCRMTC applied to become an associate member of SOCP in addition to Kirby Corporation, U.S. Marine Mgt., Inc., and Bay Ship Mgt., Inc.

RAM Database Expansion Planning

In cooperation with Mr. Chuck Amaral from Rockwell International, Newport News Shipbuilding and Bath Iron Works, a Stage II problem statement entitled "An Investigation of GCRMTC RAM Database Expansion" was prepared and submitted to GCRMTC to close the performance feedback loop by including Ship Yards / Ship Designers and equipment manufacturers. GIAB recommended this project for funding.

International Cooperation for Ship Reliability and Safety

Ship Research Institute of Japan, which is a division of Japanese Ministry of Transport, agreed to an amendment to the US/Japanese Cooperative Research Agreement for Advanced Ship Technology on May 17, 1995. According to this amendment, "... *Planning for future projects dealing with Ship Reliability Databanks to improve Ship Safety, will be shared. This information exchange will not be limited to navigation systems, but will include all ship systems. Technical Information interchange will include the areas of database operation, data collection, processing and analysis methodology, and general reports on the Reliability Data Bank System.*" It took Maritime Administration about 18 months to negotiate this agreement with the Japanese Government with the direct involvement of the US Embassy in Tokyo.

US Maritime Administration and other members of SOCP asked Dr. Inozu to meet with the officials of the Ship Research Institute of Japan during the ISME'95 Conference in July 95.

PROPOSED ACTIVITIES NEXT PERIOD:

1. Implement DATE & SHIPPER Modifications & Upgrades and start determining company specific interface requirements for DATE integration for full SOCP members.

2. Develop the SPIN software and coordinate its SOCP-wide testing.

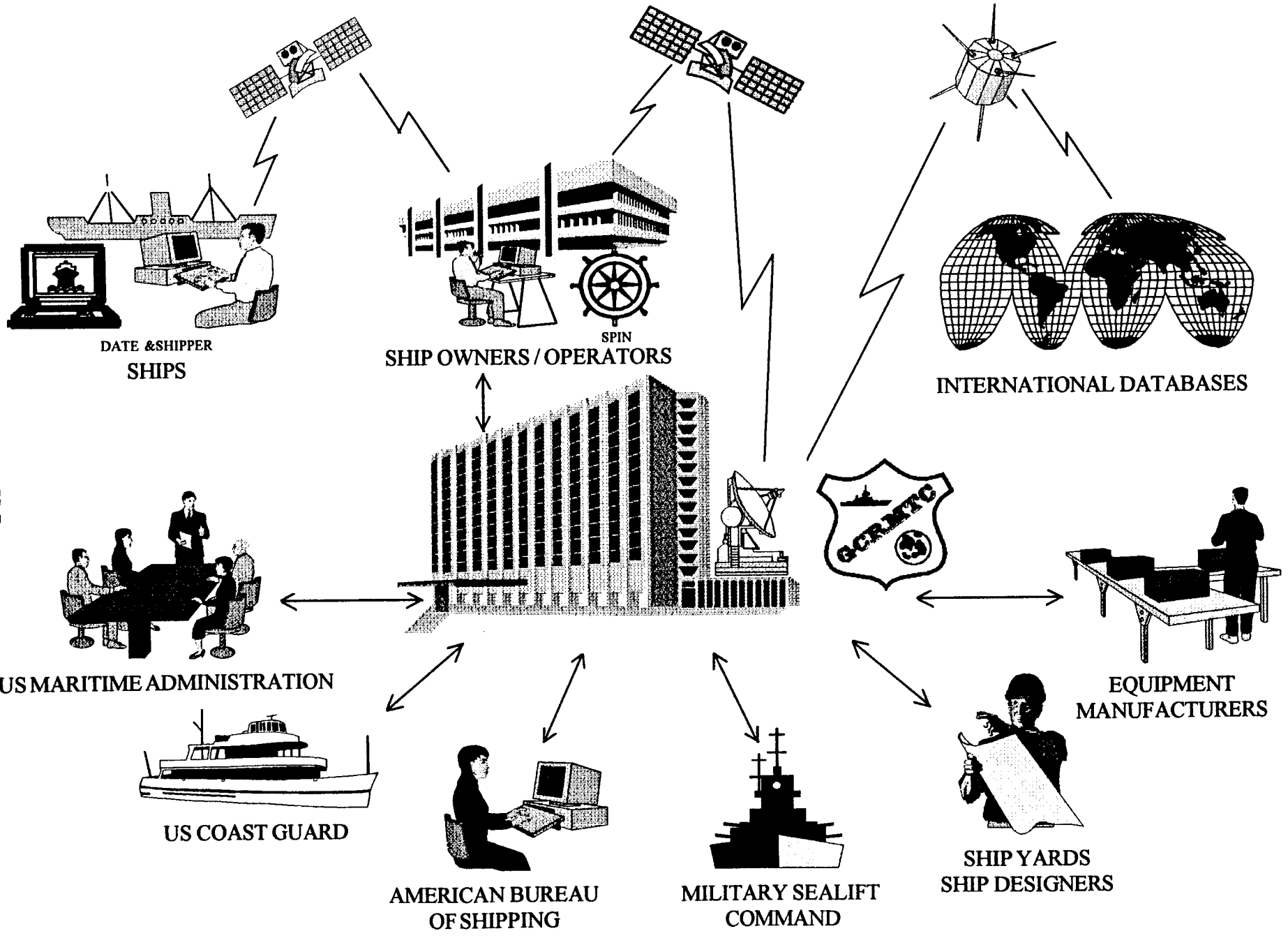
3. Finalize specifications of Ships' RAM software for the master database at UNO.

4. Participate in STEP AP 226 and other related STEP Application protocol activities under the coordination of U.S. Maritime Administration.

5. Start equipment nameplate data cross referencing and coordinate selection of critical systems at GCRMTC.

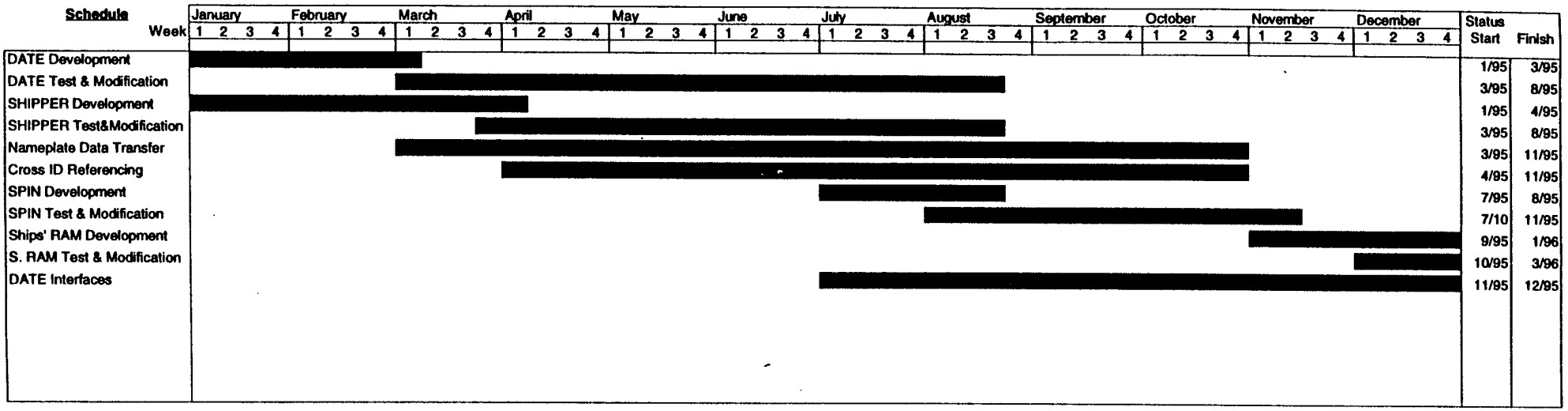
6. Hold special meetings at the headquarters of selected SOCP members for DATE interface and implementation.

7. Attend ISME'95 (Fifth International Symposium on Marine Engineering) to present three papers including "Reliability Data Banks and Cooperation for Ship Safety Worldwide" at Yokohama, Japan on July 17-21, 1995. Arrange meetings with the officials of Ship Research Institute of Japan regarding their reliability data bank.



SOCP INTEGRATED RAM DATABASE - SHIPNET

Ships' Reliability, Availability, Maintainability (RAM) Database



APPENDIX I

PERFORMANCE SIMULATION OF MARINE PROPULSION SYSTEMS UNDER EXTREME CONDITIONS

GCRMTC PROJECT NO. AMTC95-020A

Principal Investigator: **Bahadir Inozu**
Department of Naval Architecture and Marine Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: To examine the steady state and dynamic responses of the low and medium speed engines to various loads and failure modes using computer simulation. CDNSWC is primarily interested in the most frequently used types of propulsion systems on commercial cargo vessels. Three focus areas of this study are as follows:

Task 1. Examine operation in ice brash or pack ice
Task 2. Investigate extended full load operation beyond MCR (Maximum Continuous Rating)
Task 3. Examine operation with no intake air filter or with a dirty intake filter/reduced pressure in engine compartment

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$180,841
FUNDS REMAINING:	$ 72,122

ACCOMPLISHMENTS THIS PERIOD:

Simulation with UNO/ECN (SIMBAD) Code
An investigation of the sensitivity of Diesel engines' response to a variety of ice loads was initiated. Using UNO/ECN Code, simulation was done of the responses of medium speed Pielstick PA6-280, 10PC4.2 and 7PC4.2 engines under selected ramp loads provided by CDNSWC. The main focus was on developing the power-rpm characteristics in addition to BMEP , injection timing, crank angle at the beginning of combustion, combustion duration, combustion heat release, pressure-volume characteristics, in-cylinder air excess and combustion efficiency characteristics. Specifically, the coefficients of the friction losses model were modified to fit the characteristics of the 10PC4.2. In addition, modeling of the 7PC4.2 engine was completed. Due to the particularity of this engine regarding the firing gaps, our source code was modified so that it accepts non-identical firing gaps. Some simulation results for 7PC4.2, including the power-rpm characteristics, were forwarded to CDNSWC on June 15, 1995. Figure 1 shows the responses of one of the engines for an experimental ice load. Figure 2 shows the engine speed responses to a 5%/s ramp load.

Validation of UNO/ECN Code for PC4.2 Engines
Validation of our code for the PC4.2 engine using engine test-bed data was initiated. Engine manufacturer also examined our 10PC4.2 results and confirmed the accuracy of our results as "pretty good." Some minor differences between actual and simulated inlet, exhaust and fuel mass flow were attributed to a difference between actual and simulated ambient conditions by the engine manufacturer Coltec Industries.

Simulation with MERLIN

MERLIN software license agreement was approved by the purchasing department of UNO. MERLIN software was received at UNO and a copy was submitted to CDNSWC on May 5, 1995. Networking and installation problems were partially solved and MERLIN started running at UNO on June 8, 1995. MERLIN is also installed and running at CDNSWC. Dr. Inozu attended a two day MERLIN training session at Lloyd's Register in London with Dr. Kian Banisoleiman. CDNSWC requested some modifications in MERLIN Code to expand the capabilities of MERLIN for the evaluation of selected engine parameters and acceptance of complicated loads in addition to some test runs with the expanded low speed MAN B&W 10L42MC model. A subcontract has been arranged for these tasks.

Two Stroke Version of UNO/ECN Code

The first two stroke low speed engine version of the UNO/ECN Code was developed. Engine data was requested from MAN B&W via Lloyd's Register and direct contacts and most of the requested data has been received. The results of MERLIN and UNO/ECN codes will be compared.

Other Activities

Dr. J.F. Hetet from ECN visited UNO on April 27-May 4, 1995 and joined the research team of this project. A contract for services of Dr. Hetet was signed between the University of New Orleans and Ecole Centrale de Nantes, France on 5.2. 1995. Dr. Hetet also gave seminar at UNO about the simulation of engine surge.

A paper entitled "Performance Simulation of Marine Diesel Engines Operating under Extreme Conditions" was accepted for presentation at the ASME 1995 Fall Technical Conference to be held on September 24-27, 1995 in Milwaukee, Wisconsin. Dr. Bahadir Inozu, Dr. Jean-Francois Hetet, Philippe Roy and Hugues Gervaise are co-authors of this paper.

Mr. Hugues Gervaise completed his master's thesis entitled "Performance Simulation of Marine Diesel Engines Under Extreme Conditions" and graduated. Mr. Gervaise made a presentation based on his thesis at the local section meeting of Society of Naval Architects and Marine Engineers (SNAME) for student papers on March 29, 1995 at UNO. Gulf Section of SNAME gave Mr. Gervaise the best graduate student paper award for his work.

Dr. Martti Larmi of Helsinki University of Technology was contacted for the analysis and comparison of the results with his code for the low speed MAN B&W 10L42MC as desired by CDNSWC. A cost increase may be incurred over the approved project with task modifications.

PROPOSED ACTIVITIES NEXT PERIOD:

1. Continue selection and development of low- and medium speed representative engine models and obtain transient responses to test load cases.

2. Determine engine responses to simplified impulse loads.

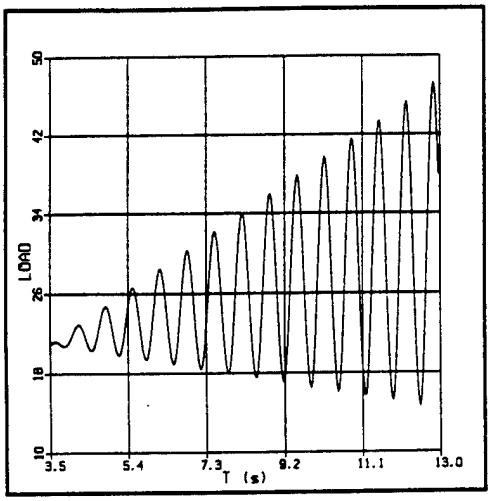
3. Make code modifications to stepwise calculate load torque from CDNSWC test-generated tabulated data for engine rpm and crank position.

4. Compare responses and develop explanation of engine response characteristics for ice loads.

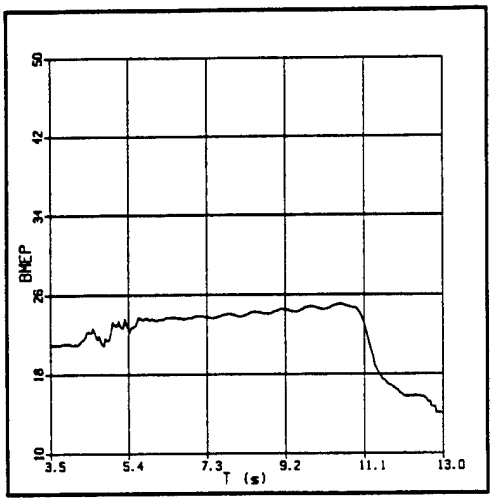
5. Arrange a special training and analysis meeting to be held at UNO on August 14-19, 1995. Dr. Banisoleiman, Jon Etxegoien and Jonathan DeHart will attend this meeting.

6. Present two papers at ISME'95 conference titled "Marine Diesel Simulation for Optimum Operation and Fault Diagnosis" by B. Inozu, J.F. Hetet and P. Roy and "An ACSL Simulation Program for Optimizing the Bypass Sections of a Two-stage Turbocharger for a Marine Diesel Engine" by J.F. Hetet, P. Chesse and B. Inozu. ISME'95 conference will be held at Yokohama, Japan on July 17-21, 1995.

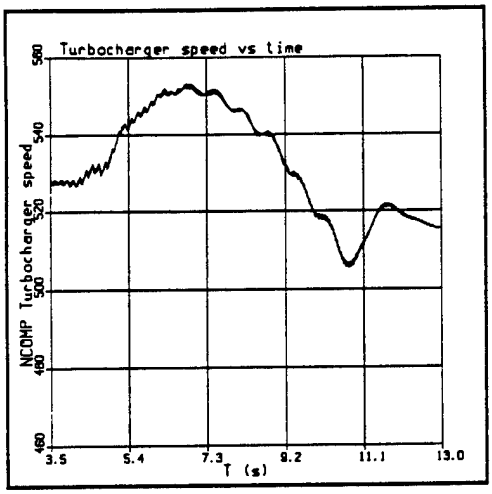
ICE LOAD



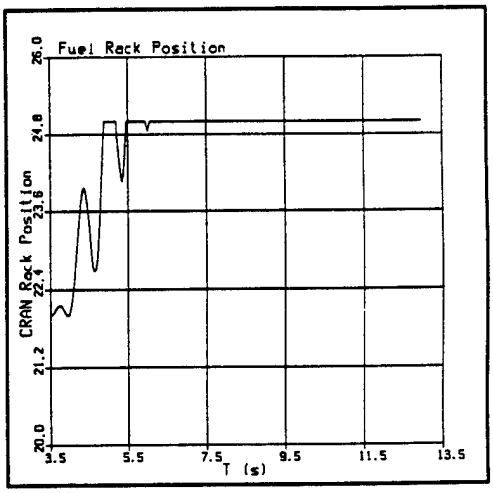
ENGINE BMEP



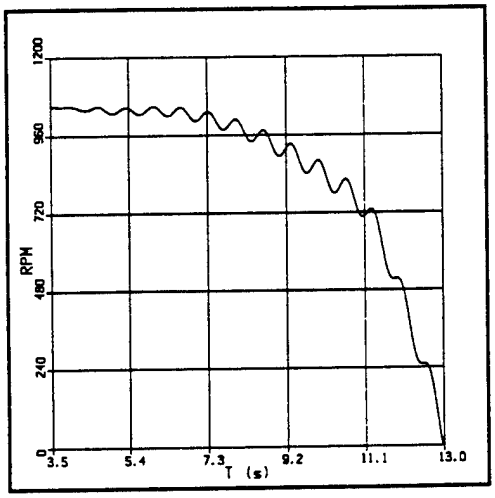
TURBOCHARGER SPEED



FUEL RACK POSITION



ENGINE SPEED



COMBUSTION EFFICIENCY

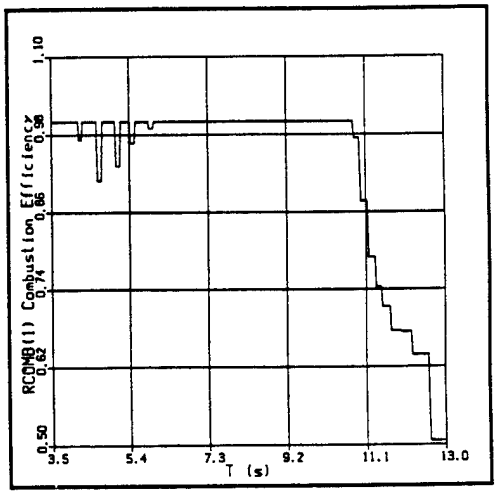
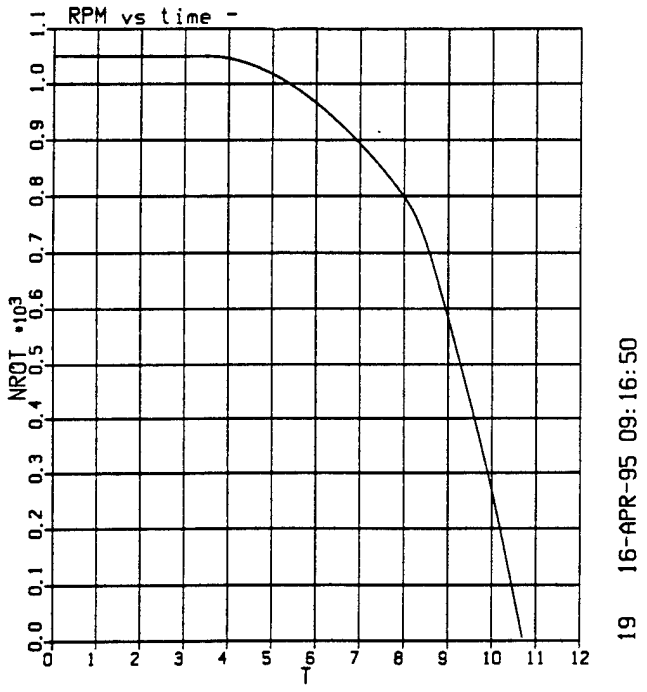
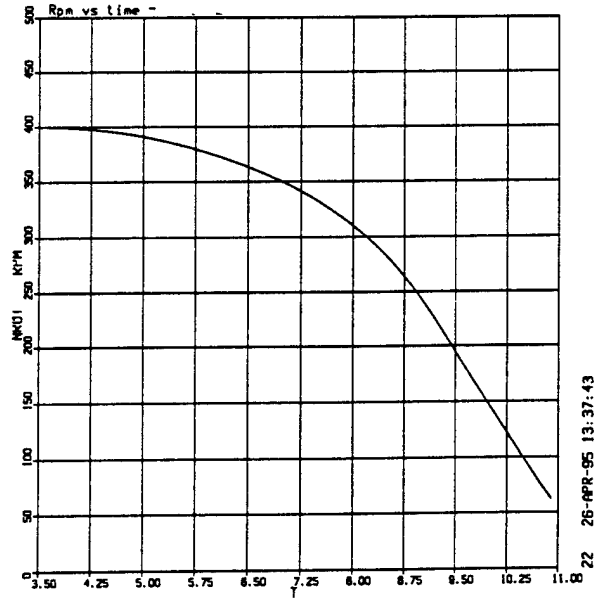


Figure 1 - Response of Engine A for an Experimental Load

RESPONSE OF ENGINE A FOR A 5%/S RAMP LOAD



RESPONSE OF ENGINE B FOR A 5%/S RAMP LOAD



RESPONSE OF ENGINE C FOR A 5%/S RAMP LOAD

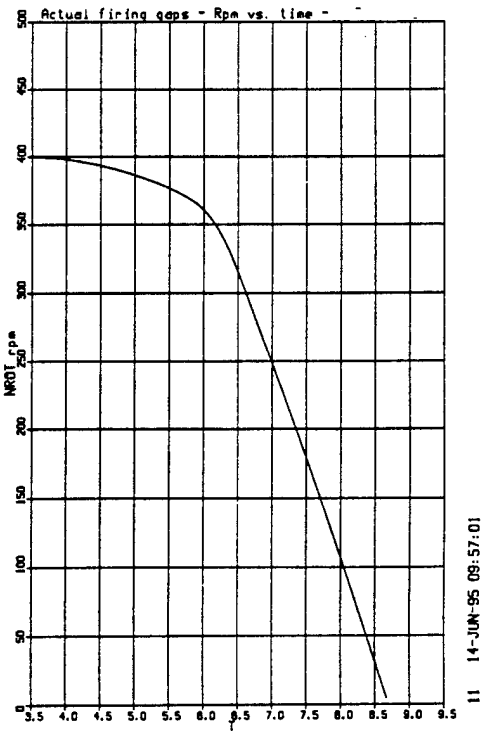
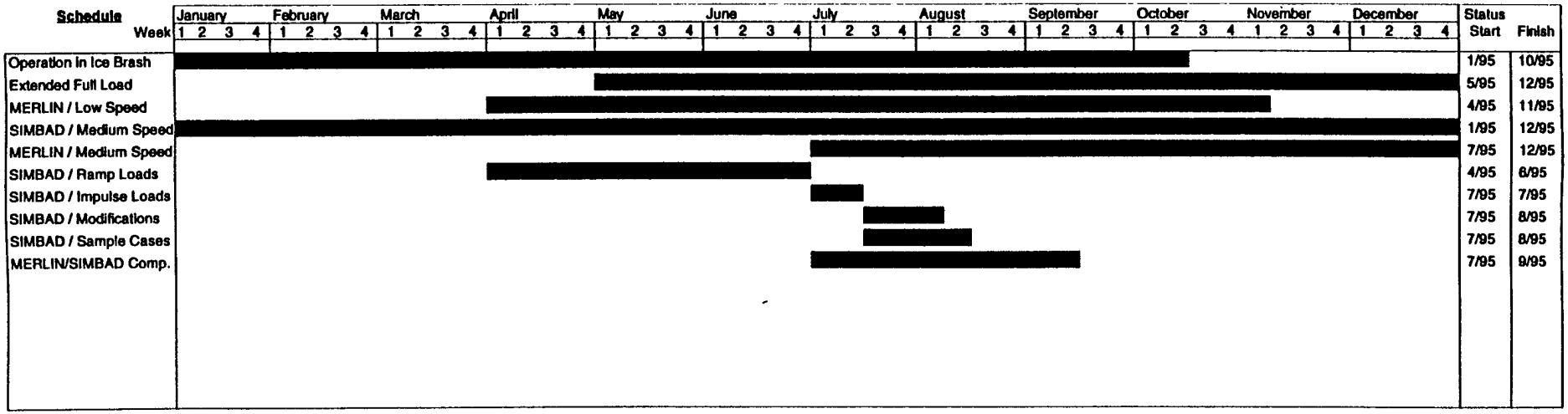


Figure 2 - Responses of Engines A, B and C for a 5%/s Ramp Load

Performance Simulation of Marine Propulsion Systems under Extreme Conditions



APPENDIX J

STUDY OF STRUCTURAL DESIGN PROCEDURES IN THE SHIPBUILDING INDUSTRY

GCRMTC PROJECT NO. AMTC95-023B

Principal Investigator: **Michael Folse**
Department of Civil and Environmental Engineering

Additional Researcher: **Norma Jean Mattei**
Department of Civil and Environmental Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: This study involves a survey of the design procedures currently in use in the shipbuilding industry. Once this is accomplished, the feasibility of improving these existing procedures though the use of a Load and Resistance Factor Design (LRFD) probability-based method of ship design will be researched. Presently, both onshore structural steel building codes (American Institute of Steel Construction - AISC) and offshore steel codes (American Petroleum Institute - API) have incorporated into their specs an LRFD method. Incorporation of an LRFD method of design into shipbuilding specs will result in a more reliable end product and the accompanying cost savings.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$90,746
FUNDS REMAINING:	$62,489

ACCOMPLISHMENTS THIS PERIOD:

NOTE: This project was approved to start mid-March of 1995, rather than the usual start date of January. The timeline that is attached to this report is indicative of this delay in beginning work.

1. A survey of ABS and DNV rules for steel ships is ongoing. Various documents have been ordered, such as Milspec 881, and those still in print have been purchased and studied. Milspec 1629, regarding procedures for performing a failure mode, effects and criticality analysis, was forwarded to the PI's by Mr. Selvidge. Pertinent publications available through the Department of Naval Architecture and Marine Engineering here at UNO have been gathered and have provided information so that the existing design procedures used in the shipbuilding industry are now understood.

2. A graduate student, Mr. Ram Mohan, has accepted the research assistantship as of May 29, 1995. Mr. Mohan graduated with highest honors from Anna University in Madras, India with a Master of Engineering in Structures. His standard test scores are excellent. Once Mr. Moham receives his visa, he will begin work on this project as well as work toward his Ph. D..

3. Task #1 of the project's research proposal includes the identification of several common ship designs. Contact with McDermott Shipbuilding Inc.'s (MSI's) Kirk Meche has been ongoing and included discussions regarding this portion of Task 1. MSI has agreed that a typical ship design be studied in this phase of the project and has provided scantling drawings and copies of design calculations at a meeting on June 19, 1995.

4. The study of ship loadings and uncertainties associated with those loadings, Task #2 and #3, has been initiated. Through several technical leads provided by Mr. Ron Selvidge and through the recommendation of Mr. John Conlon, ABS R&D dept. head, and Mr. Tom Packard, head of NAVSEA Surface Structures, this study has focused on research being done through the Ship Structure Committee. Reports SSC-363, SSC-371, SSC-368, SSC-373 and SSC-375 have provided a solid database and have established the current state of research devoted to the study of reliability-based methods of ship design.

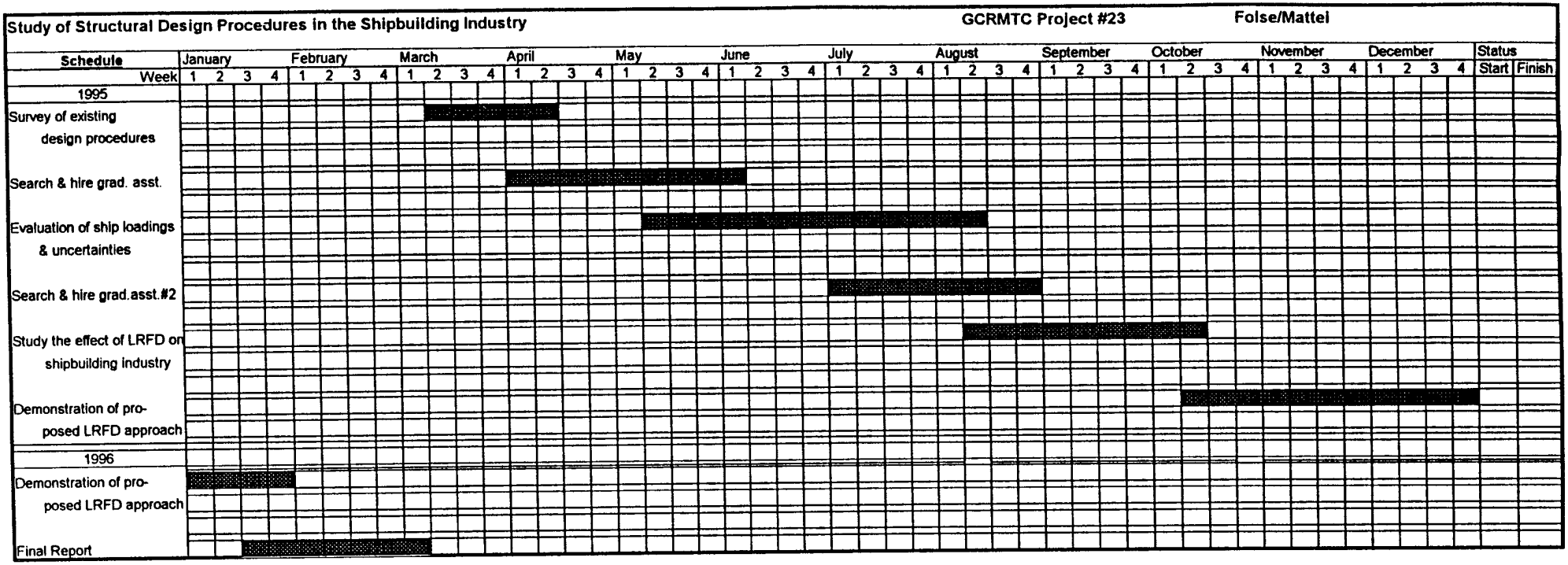
PROPOSED ACTIVITIES NEXT PERIOD:

1. Contact with MSI's Mr. Meche will continue. Common ship designs, other than the aforementioned ship, to be included in Task #6 will be discussed as well as the design guidelines specifically followed by MSI.

2. A graduate assistant was required for twelve months work. Because Mr. Mohan could not begin immediately due to logistics problems, a second graduate assistant will be hired to insure that this project may be completed in a timely manner. Care will be exercised so that the funds dedicated for graduate assistance will not be overdrawn.

3. The completion of Tasks #2 and #3 is expected by mid August. At that time the ship loadings and uncertainties to be used in Task #6 will be quantified.

4. The study of the effect of a new LRFD design procedure on the shipbuilding industry will begin in August. A brief review of literature devoted to studying the effect of LRFD on the onshore building and bridge building industries when it was implemented by AISC will be done.


Study of Structural Design Procedures in the Shipbuilding Industry
GCRMTC Project #23
Folse/Mattei
Schedule
January
February
March
April
May
June
July
August
September
October
November
December
Status
Week
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
Start
Finish
1995
Survey of existing design procedures
Search & hire grad. asst.
Evaluation of ship loadings & uncertainties
Search & hire grad.asst.#2
Study the effect of LRFD on shipbuilding industry
Demonstration of proposed LRFD approach
1996
Demonstration of proposed LRFD approach
Final Report

APPENDIX K

SOFTWARE APPLICATIONS FOR SHIPBUILDING OPTIMIZATION

GCRMTC PROJECT NO. AMTC95-027A

Principal Investigator: **Norman Whitley**
Department of Mechanical Engineering

Additional Researcher: **Stephen C. Lipp**
Department of Mechanical Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: This proposal calls for the investigation of current shipbuilding methodology and the incorporation of computer-based procedures in shipbuilding design and manufacture.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED	$185,389.00
FUNDS REMAINING	$152,295.13

ACCOMPLISHMENTS THIS PERIOD:

Accomplishments to this date are in five areas: 1) identifying areas of interest, 2) identifying information sources, 3) collecting software information, 4) visiting shipyards, 5) attending meetings and symposia, and 6) final planning for the advanced computer laboratory for shipbuilding (ACLS).

1. **Areas of Interest**. The following are areas of interest that were foreseen by the project's investigators as areas where the proper implementation of computer aids could yield great benefits:

a. **Design Software and Its Integration**. Obtaining the capabilities of "high end" 3D product modeling software with "low end" PC-based design products.

b. **Electronic Data Interchange (EDI) and Continuous Acquisition of Life-Cycle Support (CALS)**. Expose shipyards to current CALS potential, be a data center for the EDI infrastructure, develop metrics to determine which business documents should be included in the EDI effort, and help establish a common language for electronic commerce within the shipbuilding industry.

c. **Project Management and Planning**. Familiarize the shipbuilding industry with the capabilities of powerful, but affordable, project management software and include their use in concurrent engineering practices.

d. **Expert System for Standards**. The shipbuilding industry has a great number of standards required for the classing of a ship. Both Lloyd's of London and ABS have developed PC software for the classing of ships. This software analyzes a 3D CAD

model of the ship and determines if the straking and scantling are sufficient to support the ship loading. Although these packages provide classing capability for ships, other standards, including local or other government standards, may need to be met in a separate agreement. Our goal in this effort is to create a software tool which, along with the general classification software provided by ABS or Lloyd's, would create a ship which meets all necessary standards at every stage of the design.

2. **Information sources**:

a. **NSRP documents** obtained from the University of Michigan Transportation Research Institute (UMTRI) include: 1) NSRP 0212 (January, 1985) *Computerized Application of Standards: Newport News Shipbuilding*, 2) NSRP 0305 (September, 1989) *Simulation Models for Development of Optimal Material Handling; Phase I, Storage and Distribution*, 3) NSRP 0319 (May, 1991) *Investigation of the Application of Computer Aided Process Planning to Ship Modernization, Overhaul and Repair*, 4) NSRP 0346 (May, 1992) *Application of PC-Based Project Management in an Integrated Planning Process*, 5) NSRP 0361 (December, 1992) *Computerized Compendium of Standards*, 6) NSRP 0398 (December, 1993) *Producibility Evaluation Criteria: Cost Estimating Computer Programs–Manual*, 7) NSRP 0405 (December, 1993) *Development of Producibility Evaluation Criteria*, and 8).NSRP 0409 (March, 1994) *Limitations of Computerized Lofting for Shell Plate Development*. A few of these will be described:

(1) One of the publications, NSRP 0305, described Phase I of developing a simulation procedure for shipyard material handling operations. This involved the investigation of alternatives available for simulation, optimization, material handling, and database management. Additionally, material classifications, equipment choice figures of merit, and a material handling equipment database were developed. In Phase I no specific recommendations on the format of the input layout were made. In Phase II, following development of a case study of the material handling simulation, the specifics of inputting the layout was explained. At the time of publication (1989), the database software chosen for the research was Lotus 1-2-3, due to its ability and its universality.

(2) The report and software included within this package were developed under the auspices of SNAME Ship Production Committee panel SP-8 Task N8-91-6, "Application of PC-Based Project Management in an Integrated Planning Process." This task has developed a PC-Based system which serves as a tool to assist planning organizations in developing, updating, and revising ship production schedules. The system will also create and update manning, facility, and material utilization reports. The scope of the system developed is limited to the ground assembly, outfit, join, and erect operations. The report explains the system development philosophy and gives an overview of the schedule generation

system. For an IPPS (Integrated Production Planning System) to work for a particular shipyard, the shipyard must modify the coding so that the system will conform to the yard's facilities and methods of operation.

The IPPS is developed to run on IBM-compatible MS-DOS systems. The data files created when using this system will contain thousands to tens of thousands of records. For ease of use, a high performance 386 or 486 machine is recommended so that the programs will run in a reasonable time frame. The system as laid out in this report requires three pieces of commercially available software. The project management software selected is Open Plan. Open Plan operates within a dBase or FoxPro environment, so one of these pieces of software is also required. All coding included within this package is written in dBase. Manning curves generated by the system can be created by any graphics program that can chart an imported dBase file. The system described in this report makes use of Lotus Freelance.

(3) Under the SPC Panel SP-6 proposal, the technical objective of this project was to develop a compendium of standards (international, national, military, and regulatory) that have relevance to the U.S. shipbuilding and repair industry. The intended benefits were to provide shipyards with a ready reference to standards that are of use to shipbuilding and to eliminate the development of new standards where acceptable standards exist. Standards are key elements in the efficient design, construction, and repair of ships and vessels in all shipyards.

This report describes the final Compendium database and the process used in its development. The most recent development of standards compendium was completed in September 1979 under an NSRP Project entitled "A Compendium of Shipbuilding Standards," NSRP 0088.

This report also mentioned the only way to efficiently import to the database file the thousands of new standards necessary to make the Compendium a truly useful tool for industry users. For this reason, a subscription to the Information Handling Services (IHS) standards was purchased. IHS provides a database subscription service in CD-ROM format for many databases, including standards. The databases are updated on a regular basis to reflect additions, changes, or deletions to standards across a wide spectrum of domestic and foreign standards organizations. The IHS data is sent out to subscribers in the form of a CD-ROM disk with accompanying software once each quarter. But the American Bureau of Shipping standards are not coded to an acceptable level of detail. The original compendium has a much more complete listing for ABS, and these were retained in the current Compendium.

The final Compendium database contains 10,379 standards from 50 different organizations. This represents a 300 percent increase in size from the 1979 Compendium. With the expansion in military standards, coast Guard regulations, and foreign standards such as JIS (Japanese Industrial Standards), DIN (Deutsches Institute fur Normung, Germany), and BSI (British Standards Institute). The Compendium offers a much more complete reference source for shipyard personnel.

The Compendium of Standards NSRP document was an attempt to create a database with standards from the shipbuilding industry. While the effort is to be appreciated, the actual implementation of the results was not completely useful. Ultimately, the database used was dBase. This is not a difficulty in the paper; the ultimate difficulty lies with the actual input of the data. The data itself in this database was not well classified. Input items consisted of an entire standard which was input to a single record (cell). Perhaps this is due to the method of input via CD-ROM from IHS. A much better implementation would have been achieved by splitting each record into a number of classes, including materials, processes, design, etc. In its present state the database is not very useful; it would require some time to construct a useable product from the database as it now exists.

b. **Concurrent Engineering Research Center** (CERC). Now develops software for CE (concurrent engineering). CE does not appear to do anything that we do, but has complementary efforts.

c. **Software**. A great deal of software has been identified and considered in the outfitting of the Advanced Computer Laboratory for Shipbuilding (ACLS).

3. **Collecting Software Information**

Parametric Technology Corporation. Parametric Technology presented their software suite to us on May 17, 1995. Two representatives of their local sales force, Richard Duggan and Robert Binder, gave a presentation of PRO/Engineer. PRO/Engineer does not have a significant presence in the shipbuilding industry, but it is a powerful program which, with appropriate minimal modification, would have complete CAD-2 capability. It is parametric and fully associative, but lacks specific features for shipbuilding. Again, this software suite is fully capable of incorporation into the shipbuilding industry. Its cost, though expensive, is not out of the realm of possibility for small shipyards, especially if it is bought for a limited number of machines.

Cadkey, Inc. through its product Cadkey® has a 3D CAD software package which is object based. It has a single, flexible database and an easy-to-use interface. As such, other Cadkey packages, including Cadkey NC for three axis milling instructions, and Cadkey Analysis for the rough and much less expensive equivalent of finite-element

modeling (FEM) are immediate extensions to its 3D CAD capabilities. The number of translators available in their software make them a viable tool, especially considering the object basis of their 3D CAD. They claim translator compatibility with AutoCAD and complete compatibility with the Initial Graphics Exchange Standard (IGES). Their cost is low and a purchase of their full suite will be fully attainable to us and local shipbuilding.

AutoCAD. AutoCAD-13, the industry standard, will be purchased, but the full breadth of the Mechanical Applications Initiative (MAI) is yet to be seen. Without the support of the MAI, the great advantage of Autodesk software is not obvious, especially since other 3D CAD software is compatible with it and the other software offers more in terms of CAM, CIM, and CE. Furthermore, the retail pricing of AutoCAD-13 is greater than many CAD packages with which the industry could more easily work.

Microstation. Intergraph corporation's 3D CAD package is another CAD possibility. This package is reasonably priced and features backward and forward compatibility. It is not truly object based, but then again neither is AutoCAD. Speaking to persons who have used both AutoCAD and Microstation, the consensus is that Microstation is the winner due to ease-of-use and compatibility.

UniSQL. UniSQL offers a state-of-the-art suite of integrated object-oriented database systems and application development products which can be used separately or together to support complex development projects which use object-oriented development techniques, integrate sophisticated multimedia data, and require true multidatabase access to relational and object-oriented databases. As such, UniSQL can provide the linkage between standard CAD objects and other non-CAD features of these objects, such as production, manufacturing, and integration methods.

Illustra. Illustra Information Technologies, Inc. object relational database package is another object-oriented database possibility for the linkage between standard CAD objects and database features. This package roughly similar to UniSQL, though perhaps not quite as powerful. Nonetheless, there may be a way to obtain this technology at a considerably reduced price due to Illustra's "Engines for Innovation Research Grant Program."

Open Plan. Welcom Software Technology's project management software package is a logistics support possibility. This package offers multi-project scheduling, skill scheduling, rolling wave resource scheduling, resource profiling, alternate resource scheduling, and custom report writing. With its true multi-user access, CE in the shipyard can proceed without confrontation. This software has been integrated into Avondale Gulfport Marine and National Steel & Shipbuilding, to name a few.

4. **Shipyard Visits**

S. Lipp and N. Whitley visited the Bollinger Shipyard in Lockport where they met with John Burson and Brad Knight, a member of the design staff. Our areas of interest and our plan for the implementation of the ACLS were presented. Interest in our project was evident, particularly due to the fact that they are at the present time attempting to implement some basic 3D CAD technology into their shipyard. They seemed very willing to work with us in the outfitting and testing of software suites in the ACLS, which is a primary goal of this project.

5. **Meetings Attended**

a. **SNAME Gulf Coast Section Annual Meeting**, May 12, 1995. At this excellent meeting an overview was gained of the best-known shipbuilding-oriented CAD systems in the world: FORAN, HICADEK, and TRIBON (notably absent was Intergraph's ISDP). This was an important opportunity to see first-hand the leading high-end CAD systems in brief. An appreciation was gained for their capabilities and their differences. Our opinion remains that these systems, although powerful, remain too expensive for most shipyards.

NAVSEA's effort in Simulation-Based Design was presented. Both ABS and Lloyd's demonstrated their ship safety software. The use of this software during the design phase of ship development, and the use of approved material and production practices, will **guarantee** the classing of a ship when it comes off dry dock. As such, these pieces of software are essential to the ACLS. Nevertheless, being as they are required in all but name in the shipbuilding industry, their existence in the ACLS may be funded by shipbuilding industry representatives using the lab.

b. **A Learning Experience Workshop on Implementation of Concurrent Engineering in Shipbuilding** in Portland, ME. on June 7–9, 1995, was attended by N. Whitley. This meeting, sponsored by SNAME SP-8 and NSRP, was a complete workshop on integrated product development. In attendance were well-known experts on IPD (CE) who presented the state-of-the-art of IPD thought. These experts were: Bart Huthwaite of Strategic Design Consulting, Don Norling of Lockheed/ Martin Missiles and Space Company, and Dr. Jack Byrd of the Center for Entrepreneurial Studies and Development (affiliated with the University of West Virginia).

In addition, Bath Iron Works gave a lengthy and complete presentation of their efforts to change their engineering/design/ production processes to IPD. This eighteen month effort is co-sponsored by ARPA and is focused on the development of a viable commercial product. The attendees were periodically asked to participate in team exercises to reinforce the material being presented.

This was a most worthwhile meeting. N. Whitley saw first-hand the challenges that lie before the shipyards, was able to talk to individuals from shipyards and learn of their

specific problems, and could see their willingness to attempt the necessary cultural changes that IPD demands. Those shipyards represented included Avondale, Ingalls, Bath Iron Works, Saint Johns Shipbuilding, General Dynamics–Electric Boat, Trinity, and National Steel & Shipbuilding Company.

Whitley learned more specifically where software could help the IPD process. He was pleased to discover that our Identified Areas of Interest are very relevant and useful areas for inquiry and development.

In addition, Whitley made numerous contacts with shipyard personnel. After discussion, almost all showed a keen interest in what we are creating in the ACLS. The shipyards included: Saint Johns Shipbuilding, Avondale, Ingalls, GD–Electric Boat, Trinity, and BIW. Contacts with the shipyards will be continued with more specific dialogue in the coming months.

Contact was also made with other individuals who are developing software for shipyards. Software that would complement our efforts included "Quality Function Deployment" by K. J. Kim from Penn State and interface development by Ken Kaplan from MIT. Contact with these individuals will be maintained for possible cooperative work.

6. **Final Planning for the ACLS:**

A hardware purchase request has been completed to create the Advanced Computer Laboratory for Shipbuilding (ACLS). The hardware requested is 4 Pentium-90 PC's with advanced graphics cards, 32 Mb RAM, 2 Gb hard drives, with one machine being the server with CD ROM drive and DAT tape backup systems. The operating system which has also been requested is a Windows NT system. This system was chosen for its stability (it has existed for a reasonable amount of time and has been thoroughly debugged) and its compatibility with every CAD/CAM system surveyed.

PROPOSED ACTIVITIES NEXT PERIOD:

1. **Student Activities**

For the summer semester, S. Lipp has three students working. These students will be taking three different 3D CAD software packages from the ACLS and running baseline testing. This testing will come from the point of view of ship design. For example, a relevant question to be asked of 3D CAD software is whether it can create a ship hull with limited time or effort. Since the three students involved are not involved in ship

design or manufacture (all three are senior-level mechanical engineering students), it will be an appropriate test. The shipyards have often complained that when universities test software for their use, the students who test the software are far more computer literate than the shipyard personnel. Therefore, the test will be leveled by giving the students shipbuilding designs which are foreign to them. If the "computer literate" students are able to complete foreign designs in limited time, the shipyard's personnel may be able to complete similar designs in similar time. In the case of the students, the time spent will be in learning shipyard design practice. For the shipyard personnel, the time spent will be in learning the software.

2. **Proposed Shipyard Visit**

Avondale Industries (June). A meeting has been scheduled with Steve Maguire of Avondale Industries to discuss their and our future plans in the area of software implementation in the shipyard. Steve Maguire has expressed interest in participating in the ACLS.

3. **Software Information**

Information will continue to be gathered on software of various types. Database software, particularly object-relational database management systems, are of great interest due to there apparent capability to create 3D product model clones at a fraction of the cost of the full-blown 3D product modelers. High-end fully integrated and fully associative product model software may be within the financial reach of only a very few shipyards. It will be necessary to further investigate low-end 3D solid-model software, establishing its potential in a world moving to a 3D product modeling standard through STEP. The STEP protocol requires some care in the choice of a 3D CAD system; a 3D CAD system without the standards of STEP may be deemed inappropriate regardless of its price.

We will seek information/participation from Parametric Technology Corporation. Their product Pro/ENGINEER is a fully integrated/associative product modeler. It also has a module available for importing legacy data/information as well as a module for doing design for manufacture. It is to our knowledge the only product model software that includes design-for-manufacturing (DFM) capability. It is fully STEP compliant and a truly complete package, save for its lack of software tailored specifically to shipbuilding. With appropriate agreements in place, the package may be obtainable.

Boothroid Dewhurst, Inc. (BDI), an industry leader in design for manufacture and assembly software, will be contacted about obtaining their software products.

An investigation will continue of the potential of the Mechanical Applications Initiative that was announced by Autodesk. This initiative will make it possible for a whole suite

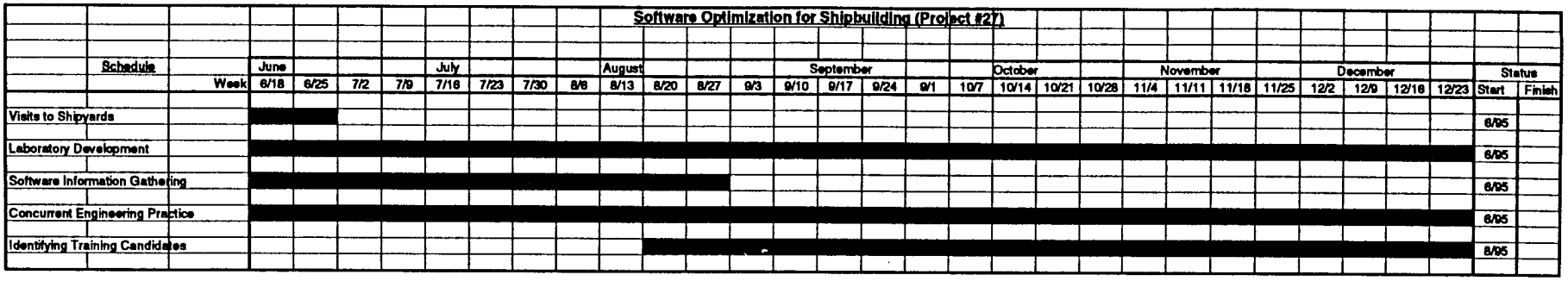
of mechanical design and manufacturing software packages to communicate with one another using a common interface.

Other computer software packages that are productivity enhancing agents in the design and manufacturing processes will be identified.

4. **Lab Development**

Provided vendors are obtained, the Advanced Computer Laboratory for Shipbuilding (ACLS), will be established in the next month. By July/August the goal is to have hardware and software in place to perform initial evaluations of the potential of such hardware/software, the need for customization, and its capacity to seamlessly integrate with other computer design and manufacturing packages.

Software Optimization for Shipbuilding (Project #27)



APPENDIX L

IMPROVING TECHNOLOGY TRANSFER IN THE SHIPBUILDING INDUSTRY

GCRMTC PROJECT NO. AMTC95-030A

Principal Investigator: **Will Lannes**
Assistant Dean, College of Engineering

Additional Researcher: **James W. Logan, Jr.**
Department of Management

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: The purpose of this project is to develop an improved technology transfer process for use in the shipbuilding industry. The deliverables from this project consist of an improved technology transfer process, incorporating industry best practices and current knowledge in organizational change into a matrix evaluation model, and its accompanying implementation protocol. The recommended model incorporates financial, technical, and behavioral factors into a normative model designed to enhance organizational technology transfer. The model is to be used by firms in the shipbuilding industry to evaluate current firm practices against best practices and to identify target areas for improvement within a firm. The model is customizable to individual firm needs to insure maximum usability. Additional benefits of this project are the generation of a current data base of literature on the subject of technology transfer in the shipbuilding industry, and increased understanding within both the College of Business and the College of Engineering of a very significant regional industry.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$127,549
FUNDS REMAINING:	$89,496

General Schedule of Project Events:

Q1,1995 - Literature Review and Instrument Development
Q2-Q3, 1995 - Interviews, Surveys, and Model Prototype Development
Q4, 1995 - Q2, 1996 - Prototype Test and Improvement
Q3 - Q4, 1996 - Final Model Test, Publication, and Implementation

Project Milestone Schedule:

1. Global literature review and initial interview instrument development.
2. Initial field interviews to establish validity of industry structure model.
3. Initial survey instrument development and pretest.
4. Identification of target population and survey sample.
5. Survey of sample population.
6. Analysis of initial data.
7. Development of prototype model and protocols for usage.
8. Test of prototype model in multiple field settings. The model will be tested at this stage in cooperating companies and with other GCRMTC projects in which it may prove useful.
9. Iterative steps by field interview and improvement to improve usefulness of model.
10. Establishment of final model and usage protocols.

ACCOMPLISHMENTS THIS PERIOD:

Milestones Achieved:

The milestones below reflect progress to date:

Milestone 1: Initial literature review from U.S. and U.K. sources completed. Literature search is ongoing for sources (from or about) Korean, Japanese, and European practices, although many practices in these countries are documented in U.S. based publications.

Primary Investigators and Consultant have made site visits, presentations, and received feedback on our proposed actions at the following sites: McDermott Shipbuilding, Ingalls Shipbuilding, Trinity Marine in Gulfport, and Textron in New Orleans. In addition, the primary investigators attended the Society of Naval Engineers regional meeting in Biloxi, where the project consultant presented a paper. Substantial discussions have been held about technology transfer in the shipbuilding industry with multiple participants at each of these visits. The industry participants at these visits have been executives responsible for specifying and funding technology used in the various shipyards.

Milestone 2: During initial literature review, the research team identified an industry structural variable that had the potential to seriously impact the proposed model. Accordingly, milestones 1&2 were pursued concurrently in order to decrease the amount of rework necessary. Initial visits to representative industry firms have been made, and writing the actual structured interviews is in progress. Our initial thoughts on the impact that industry structure had on the technology transfer process have been confirmed.

There are at least three primary industry strategic groups that seem to operate with different technology transfer mechanisms and justification schemes. The U.S. shipbuilding industry is divided into shipyards that primarily build or rework ships for the U.S. Navy, larger commercial yards that have the capability to build either commercial or some U.S. Navy ships, and smaller commercial yards that typically do not build large commercial ships or have Navy contracts. There seem to be important differences in the technology justification process and standard practices between these three shipbuilding industry strategic groups, although all seem to have a place in the shipbuilding industry of the future.

Milestone 3: Based on achieving more from the initial site visits than had been anticipated, and following several brainstorming sessions by the research team, there is enough data to begin construction of the initial survey questionnaire. It would be advantageous to have this initial questionnaire to show to our initial interviewees so that definite feedback can be obtained.

Milestone 4: In keeping with the decision to concurrently proceed with as many milestones as possible, a listing of all U.S. and foreign shipyards has been obtained, as well as more detailed information about larger shipyards in the U.S. This list has been entered into a merge file for use in computer generated mailout for questionnaire and follow up.

Milestone 5: As this report was being prepared, the survey instrument was in the final development stage prior to being mailed. Due to lessons learned in earlier stages of this research, the team has decided to take a second look at the proposed deliverable schedule, including the expected survey results, to insure that maximum information can be gained with one mailing of the survey instrument. This may mean a short delay in the survey instrument mailing.

Milestones 6 - 10: To date, no progress has been made on these areas of the study.

In addition to the above milestones, the team submitted a National Science Foundation Grant proposal that builds on the research results generated to date. The proposal is a one-year study that develops an expert system to help technology transfer managers select measures of technology transfer efficacy that are usable across an organization.

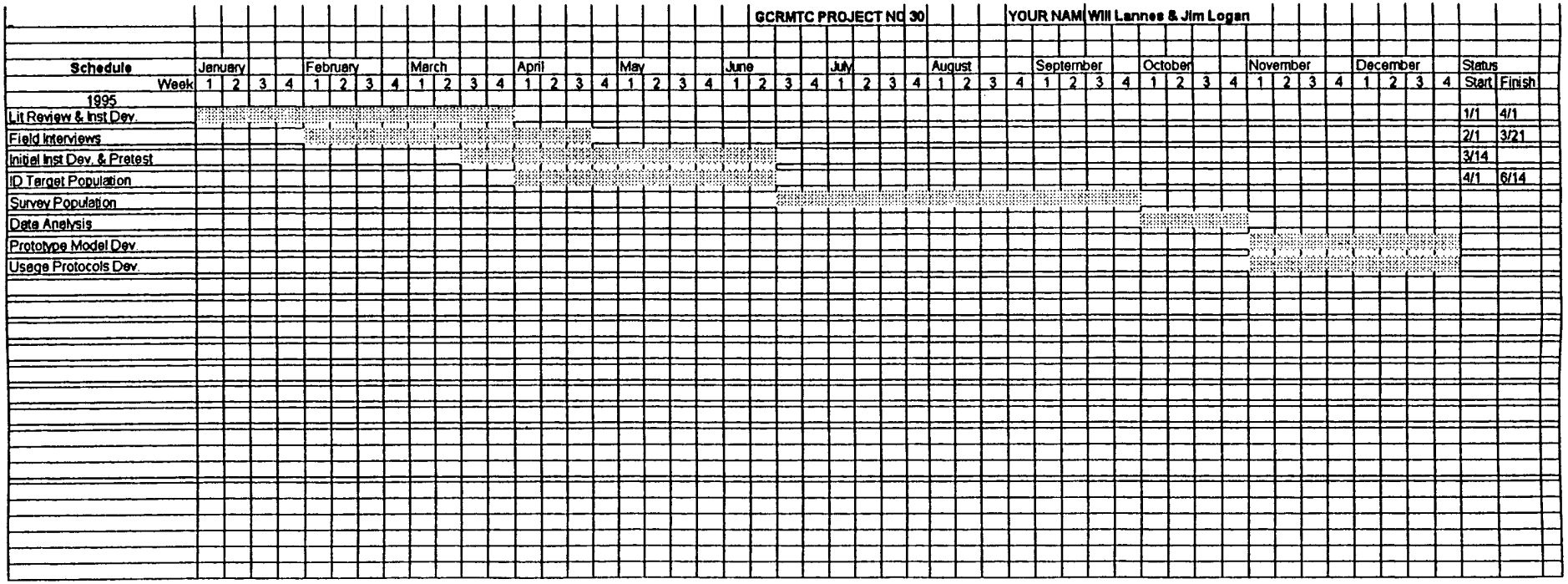
Action Taken as Result of Last Quarter Review:

It was suggested that the Project 30 team contact Patricia Pate from the John Gray Institute who is working on a GCRMTC Lamar project which seems to be similar. Contact has been made with Dr. Pate, and information on this project has been forwarded to her. A team conference call to discuss collaborative efforts will be set up.

PROPOSED ACTIVITIES NEXT PERIOD:

Plans for Next Quarter:

The plans for next quarter are to finalize the survey instrument, mail it to the mailing list of shipyards, follow up on the mailing via telephone, mail, and e-mail message to insure an adequate response rate, and begin analysis of the data. Concurrent with this effort, a preliminary model of the technology transfer process is being generated, based on past industry research. It should be noted that this project was designed to be a two-year project. If the project is only funded for one year, there is a substantial risk of not achieving the primary purpose of this research. The second year is necessary to work with the industry participants and other GCRMTC researchers to implement the model and make iterative changes that will customize the model to individual strategic groups. The model test stage is designed to work with industry participants as they actually implement technology within a firm. The proposal will be resubmitted for the next review session so that the testing of the model can be accomplished. Much will be learned during this second year that will not be obvious in the first year of research.


GCRMTC PROJECT NO 30
YOUR NAM Will Lannes & Jim Logan
Schedule
Week
January 1 2 3 4
February 1 2 3 4
March 1 2 3 4
April 1 2 3 4
May 1 2 3 4
June 1 2 3 4
July 1 2 3 4
August 1 2 3 4
September 1 2 3 4
October 1 2 3 4
November 1 2 3 4
December 1 2 3 4
Status Start Finish
1995
Lit Review & Inst Dev. 1/1 4/1
Field Interviews 2/1 3/21
Initial Inst Dev. & Pretest 3/14
ID Target Population 4/1 6/14
Survey Population
Data Analysis
Prototype Model Dev.
Usage Protocols Dev.

APPENDIX M

DIGITAL IMAGE PHOTOGRAMMETRY

GCRMTC PROJECT NO. AMTC95-035A

Principal Investigator: **Cliff Mugnier**
Adjunct Instructor, Civil and Environmental Engineering

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: A problem in modular shipbuilding is the lack of a reliable and quick method of obtaining and utilizing dimensional control. Photogrammetry has been successfully used as a tool for this application, but because of the large number of systematic errors associated with film-based cameras, only very large shipyards have attempted this. Recently, developments in Charge Coupled Device (CCD) imaging arrays for cameras have allowed some success in applying photogrammetric techniques *without film* in dimensional control. The software and hardware configurations have been expensive and complicated. Digital camera systems and computers will be purchased and programmed to tie existing inexpensive software packages originally designed for mapping into a tool for production shipyard fabrication dimensional control.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$327,017
FUNDS REMAINING:	$146,000

ACCOMPLISHMENTS THIS PERIOD:

FIRST QUARTER:

Initiated Industry Survey, made contacts with local shipyards (Avondale, McDermott & client yards of A.K. Suda) for arrangements for tours of facilities - still in progress.

Contact has been made with the Defense Technical Information Center (DTIC). An application is being made for the GCRMTC UNO Site to have a DTIC account number for all researchers.

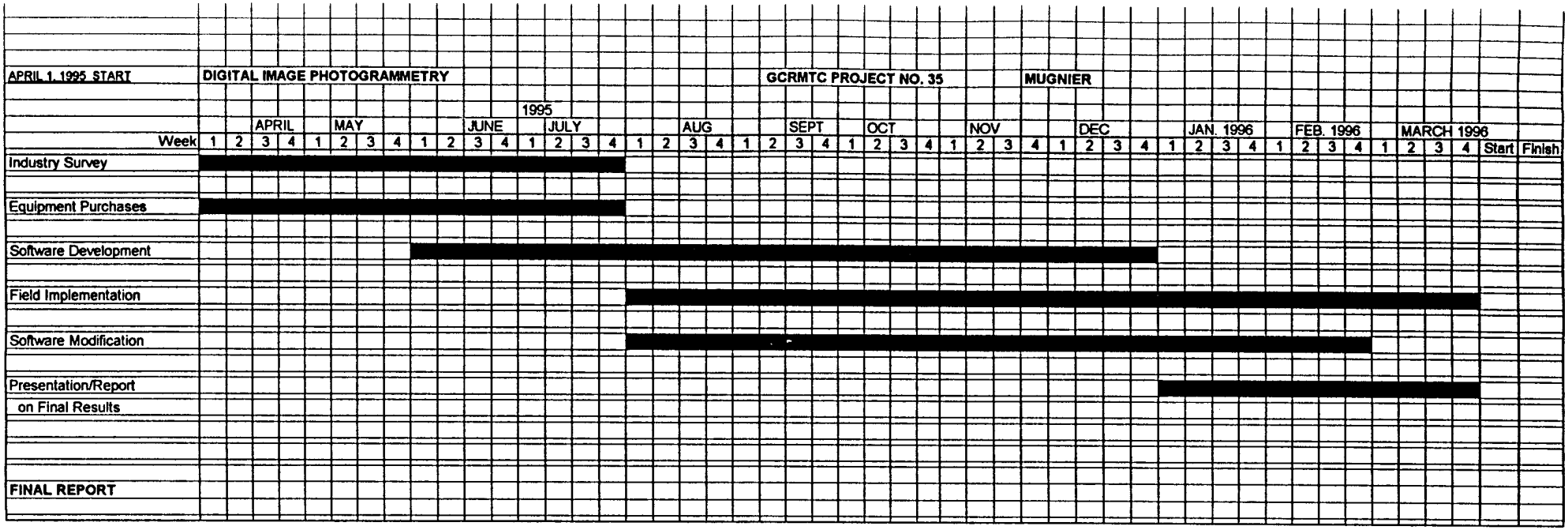
The KODAK "MegaPlus 4.2" camera system originally proposed (Fall, 1994) for research has been made obsolete (Spring, 1995) by another division of KODAK. Tech Support with Kodak was contacted, suitability of new system was verified, (it is substantially more appropriate for outdoor use), and technical manual for software & data format needs has been received. Camera has been bid, request for purchase authorization has been submitted to GCRMTC. New camera (KODAK "DCS 460") went into production in May of 1995, and requires no cable connectors to a computer/memory device. The cameras are all self-contained. Software and computer needs changed as a result, and research for the new system configuration is now complete. Between 80% - 90% of software and hardware has been selected, specified, and has been introduced into the procurement system. Minor purchasing details remain such as carry cases, tripods, targets, attachments, etc. Familiarization with some software packages has started, pending receipt of hardware still in the procurement process.

PROPOSED ACTIVITIES NEXT PERIOD:

Continuation of Industry Survey and completion.

Software development & integration.

Creation of Test Procedure Document for field verification of results.


APRIL 1, 1995 START
DIGITAL IMAGE PHOTOGRAMMETRY
GCRMTC PROJECT NO. 35
MUGNIER
1995
APRIL
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
JAN. 1996
FEB. 1996
MARCH 1996
Week
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 Start Finish
Industry Survey
Equipment Purchases
Software Development
Field Implementation
Software Modification
Presentation/Report
on Final Results
FINAL REPORT

APPENDIX N

SHIP CAPSIZING (AN ACCURATE AND EFFICIENT TECHNIQUE TO PREDICT SHIP ROLL DAMPING)

GCRMTC PROJECT NO. AMTC95-036A

Principal Investigator: **Jeffrey M. Falzarano**
Department of Naval Architecture and Marine Engineering

Additional Researcher: **Richard A. Korpus**
Senior Research Scientist, Marine Hydrodynamics (SAIC, Ship Technology)

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: This project will develop an accurate and efficient technique to predict ship roll damping using the Finite Analytic Reynolds Averaged Navier Stokes (FA-RANS) solution technique. This capability will be used to improve naval and commercial hull form design with regards to minimizing the most critical resonant roll motions and loads. The approach to be utilized will be to apply progressively more accurate yet computer intensive approximations. Comparisons will be made with published and to be obtained model and full scale data. Extensive use will be made of existing SAIC capability and UNO experimental and computer resources including the newly installed UNO Cray J916.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$222,296
FUNDS REMAINING:	$164,972

ACCOMPLISHMENTS THIS PERIOD:

In addition to work completed at UNO and SAIC Annapolis separately, three visits to UNO by SAIC personnel were made as follows:

3/29-4/1 During the visit of Dr. Dinavahi and while running a number of test cases, problems were identified with convergence for certain cases.

4/23-4/29 During the visit of Dr. Korpus and following the discovery of convergence problems for certain cases, scaling was revised and extensive convergence studies and validation runs commenced. Moreover, work was begun with Bilge -Keel case and development of the Free-surface boundary condition tasks. A meeting was held with P. Mukerjee (Chief Naval Architect of McDermott Offshore) regarding the project and the practical uses of its results. He was very supportive and had some useful practical suggestions regarding his needs.

5/9-5/11 During the visit of Dr. Korpus and considering the suggestions of P Mukerjee, development was begun of 2-D unsteady panel method to allow separation of ideal and viscous forces. The results can be readily used with standard ship motions computer programs. The bilge keel grid capability was also completed. At this time, the panel method in preparation for running the systematic series is still being validated.

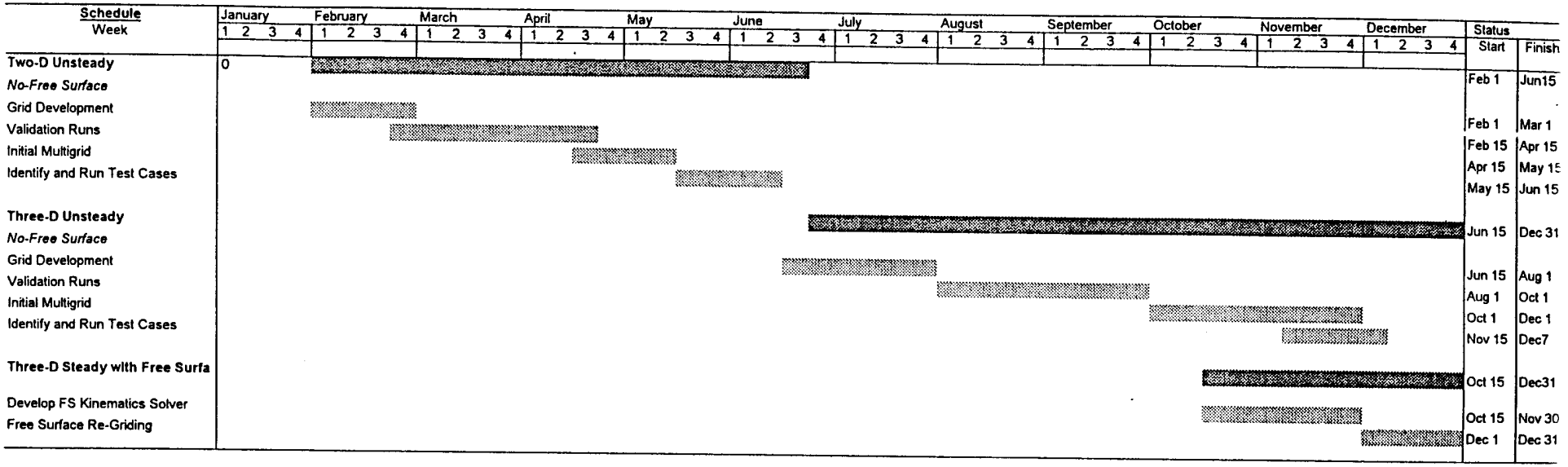
PROPOSED ACTIVITIES NEXT PERIOD:

Complete 2-D Free-surface boundary condition development. As per the suggestion of P. Mukerjee, for the 2-D with a free-surface case, a wall-sided with bilge radius systematic series will be produced. The following six parameters will be varied: 1) Beam/Draft, 2) bilge radius/Draft, 3) motion frequency, 4) roll center (roll and sway), 5) bilge keel size, and 6) motion amplitude. A meeting will be held with P. Mukerjee again, in order to get his input on a useful range of some of the parameters.

The 2-D development tasks are on schedule (see attached time line). The 2-D free-surface and development of a systematic series represent slight deviations from the original plan but this will facilitate, more efficient completion of future tasks and make the results more widely available and practically useful.

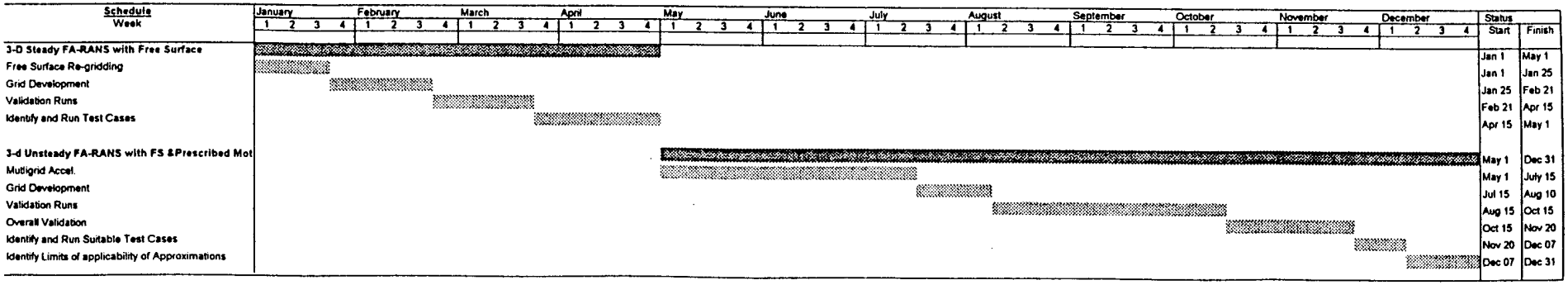
Ship Capizing (An Accurate and Efficient Technique to Predict Ship Roll Damping)

YEAR 1



Ship Capizing (An Accurate and Efficient Technique to Predict Ship Roll Damping)

YEAR 2



APPENDIX O

MOTION SICKNESS AND ANTI-MOTION SICKNESS TREATMENT

GCRMTC PROJECT NO. AMTC95-5117B

Principal Investigator: **Thomas G. Dobie**
Department of Psychology

Additional Researcher: **James G. May**
Department of Psychology

University of New Orleans
New Orleans, LA 70148

PROJECT SYNOPSIS: Motion sickness and related illness impair performance of Navy personnel and often result in a complete inability to carry out an assigned task. *Naval Medical Information Management Center* data from a recent fifteen month period show that, on ships ranging from nuclear-powered aircraft carriers to repair ships, enlisted personnel incapacitated due to motion sickness cost the Navy $135,000,000 in lost man days. This does not include additional costs of medication and medical monitoring. Motion-produced vestibular stimulation also greatly affects sleep, often inducing severe fatigue which is a concern for sustained operations. To remedy these and other problems, the current project is aimed at validating a cognitive/behavioral anti-motion sickness training program developed at the Naval Biodynamics Laboratory by Dr. Thomas G. Dobie.

The primary goal is to offer an intervention and management strategy for U.S. Navy personnel exposed to motion environments. Validation involves training others to employ the technique and testing their ability to use it. Upon validation of the cognitive/behavioral program, we will begin to transition the technique to appropriate field operational setting through the use of Technology Transfer channels. A secondary goal is to develop predictors of motion sickness that might be used in personnel selection.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$100,000
FUNDS REMAINING:	$ 91,000

ACCOMPLISHMENTS THIS PERIOD:

Dr. Dobie's services have been obtained through a subcontract with him for $9,000 to cover fees and travel. During that subcontract, the following progress was made on the project.

Task #1: Develop Training Program for CBMT Trainers:

a) The proposal for a course of training for CBMT Trainers has been reviewed and approved by NBDL;

b) A "Handbook of Cognitive-Behavioral Training", for use by trainers is in preparation, and is now 90% completed;

c) Plans have been drawn up to evaluate the new mechanical training device prior to its transfer to a fleet location. A search is being made for a suitable site at UNO to move the chair for initial checkout. (see Task #2)

Task #2: Assist in Technology Transfer of the CBMT Program:

Dr. Dobie, CDR Dolgin, and other NBDL personnel traveled to the East Coast LCAC site for evaluation as a potential field for validation trials. Phase 1 of that task has been modified to involve a questionnaire study of all LCAC personnel and the treatment of selected cases here at UNO. Negotiations have commenced with the NAMRL facility in Pensacola, and an additional plan is to add aviators from Whiting field as validation cases. A meeting of a working study group on motion sickness is planned at NAMRL in July.

Task #3: Assist in Construction of a Selection Tool on Motion Sickness:

A review of the problems found in NBDL validation studies on the SMS is being conducted with the Human Factors Group at NBDL. The review of literature on this matter continues and we will remain in touch with European and American psychologists in this field. As far as an evoked potential index of motion sickness is concerned, we are standing by to review any results forwarded by NBDL.

Task #4: Personality:

This project has just started in the form of a literature survey to obtain existing information on the relationship between motion sickness and personality profiles prior to carrying out investigative trials. A putative battery has been selected for use with the questionnaire study with the aviators from Whiting Field and Coast guard personnel in San Diego.

PROPOSED ACTIVITIES NEXT PERIOD:

Data collection and field testing of the Cognitive-behavioral technique will begin by August at a remote site (e.g. Whiting Field). The battery of personality tests to be used in evaluating the relationship between those variables and motion sickness susceptibility has been selected.

Five counselors will be trained in the use of Cognitive-behavioral treatment and the use of the rotating/tilting chair. The handbook on Cognitive-behavioral counseling will be completed as will the literature review on motion sickness and screen putative personality tests for test-retest reliability.

Motion Sickness and Anti-Motion Sickness Treatment

Schedule	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Status
Week	1234	1234	1234	1234	1234	1234	1234	1234	1234	1234	1234	1234	S/F
Task 1													2/95 7/95
Task 2													7/95 12/95
Task 3													3/95 11/95
Task 4													4/95 11/95

Task #1: Develop Training Program for CBMT Trainers
Task #2: Assist in Technology Transfer of the CBMT Program
Task #3: Assist in Construction of a Selection Tool on Motion Sickness
Task #4: Personality

APPENDIX P

GULF COPPER AND MANUFACTURING CORPORATION BUSINESS PROCESS IMPROVEMENT

GCRMTC PROJECT NO. OR95-001A

Principal Investigator: **Patricia Pate**

Lamar University
Orange, TX 77630

PROJECT SYNOPSIS: Business Process Improvement for planning and management of short turnaround shipyard repair projects through the use of quality initiatives and business process improvement strategies and process simulation.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$134,719
FUNDS REMAINING:	$134,719

ACCOMPLISHMENTS THIS PERIOD: Began defining current business strategies toward improvement development plan. Identifying business status and forecasted status as known prior to changes resulting from study's.

PROPOSED ACTIVITIES NEXT PERIOD: Formalized improvement plan. Develop and assemble project team. Conduct initial training for project team to assist in continuing input of work processes as they exist now and opportunities for future.

APPENDIX Q

TEXAS GULF COAST REGIONAL SHIP REPAIR MARKET ANALYSIS

GCRMTC PROJECT NO. OR95-002B

Principal Investigator: **Roy Huckaby**

Lamar University
Orange, TX 77630

PROJECT SYNOPSIS: The focus of this study is on the ship repair sector of the Texas Gulf Coast economy. The study will identify existing facilities of firms engaged in ship repair, potential market for repair services, and factors determining selection of firms providing repair services.

BUDGET STATUS:

TOTAL AMOUNT BUDGETED:	$122,381
FUNDS REMAINING:	$107,035

ACCOMPLISHMENTS THIS PERIOD: The research team has been organized, with tasks and lines of supervision identified. Literature review has been initiated, sources of industry-specific data have been identified and ordered, and interviews with firms in the industry have been conducted or scheduled.

PROPOSED ACTIVITIES NEXT PERIOD: Work will continue in gathering and analyzing secondary data. It is expected that the sources which were ordered during the last period will identify additional avenues of investigation, and these will be explored. Additional personal interviews with firms in the ship repair and water transportation sectors will be conducted. Questionnaires and lists of questionnaire recipients will be developed.